

Erosion Control Plan

North Umpqua Hydroelectric Project (FERC Project No. 1927)

Volume 2 - Appendix A HIGH and MEDIUM Priority Sites Remediation Data

Prepared by:

Washington Group International
Bellevue, Washington
and
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Portland, Oregon

In Consultation With:

USDA Forest Service, Pacific Northwest Region, Umpqua National Forest
NOAA National Marine Fisheries Service (NOAA Fisheries)
USDI Bureau of Land Management, Roseburg District
USDI Fish and Wildlife Service
Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife
Oregon Water Resources Department

April 26, 2004

Erosion Control Plan

North Umpqua Hydroelectric Project (FERC Project No. 1927)

Volume 2 - Appendix A HIGH and MEDIUM Priority Sites Remediation Data

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Fish Creek Site
Slide Creek Site
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Site #	LM2-4		Priority Ranking	High		Locator Information/GPS		
			Impact Rating	3			Lat:	Long:
Project Development:		Lemolo 2	Risk Rating	2		Start		
Nearest Project Feature:		Access road along Deer Cr	Structure Type:		Access Road	Reference Point	No signal - heavy tree cover	
						End		
Description of Concern: Failure of Deer Creek access road. Failure occurred in 1997 along approximately 70 ft of access road. Material slid directly into Deer Creek. Height of failure area approximately 30 ft. Failure site is 1922 feet from point at which access road intersects FS road 34.								
Proposed Remediation: Repairs completed in 2000. Failed area restored with large-diameter rip-rap. See attached photos.								
Remediation Task Breakdown:			Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches	
							No further action required.	
NA								
Data Collection Information:						Mass Bal	Borrow	CY
Team:	Robb Barr, Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees			Excess Fill	CY
Date:	14-Nov-01		Time:	10:00am			Waste	CY

LM2-4 Site Photo Deer Creek Access Road

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Deer Creek site had a slope failure in 1997. This area was repaired in 2000. No further erosion control measures recommended at this site.

Extent of year 2000 repairs.
Repairs consist of rock slope replacement that will allow slope drainage and prevent erosion at the toe of the slope.



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Site #	LM2-6		Priority Ranking	High		Locator Information/GPS		
			Impact Rating	3		GPS shows 33 ft accuracy		
			Risk Rating	2		Start	Lat:	Long:
Project Development:		Lemolo 2				Reference Point	43' 19.147"	122' 21.130"
Nearest Project Feature:		Waterway	Structure Type:		Gunite Canal	End		
<p>Description of Concern: Gunite-lined canal section also sometimes referred to as Flume 19. Shallow slump, bulge in canal with geomembrane and gunite repair. Spoil on downslope of canal. Drains installed in the 1960's. Movement of upslope area of about 2 feet during the winter of 1996-1997 caused flow constriction in canal.</p>								
<p>Proposed Remediation: Monitor for signs of further movement. Implement one or more additional remedial measures outlined in Squier Associates report if further deformation occurs. Past failure events appear to be related to exceptionally heavy precipitation.</p>								
Remediation Task Breakdown:			Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches	
Monitor Site							<p>Two past failures have been documented at this site, the first in the 1960's and the second in the winter of 1996-1997. Both failures caused deformation and cracking of the upslope gunite wall of the canal, resulting in a flow constriction, but no overflow or catastrophic failure. The area was remediated in the 1960's through the installation of a series of surface/subsurface drains.</p> <p>Squier Associates conducted additional geotechnical investigations in 1997 (see reference list). Following their recommendations, improvements were made to the existing surface drainage channels. No additional deformation has been observed since that time.</p>	
Establish survey monuments			8	HR				
Establish crack measurement pins			8	HR				
Data Collection Information:						Mass Bal	Borrow	CY
Team:	Robb Barr, Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees			Excess Fill	CY
Date:	14-Nov-01		Time:	10:30am			Waste	CY

LM2-6 Site Photos

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Looking
upstream at
bulge area.

Monitor for movement of the side of the canal and crack growth. Install steel pins to allow monitoring of crack growth.



Geomembrane and gunite canal repair

Looking
downstream at
bulge area.

LM2-6 Site Photos

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Picture looking upstream on down slope side of access road. Spoil pile apparently extra drainage rock from French drain installation up-slope of bulge in canal. No erosion concerns associated with this material.

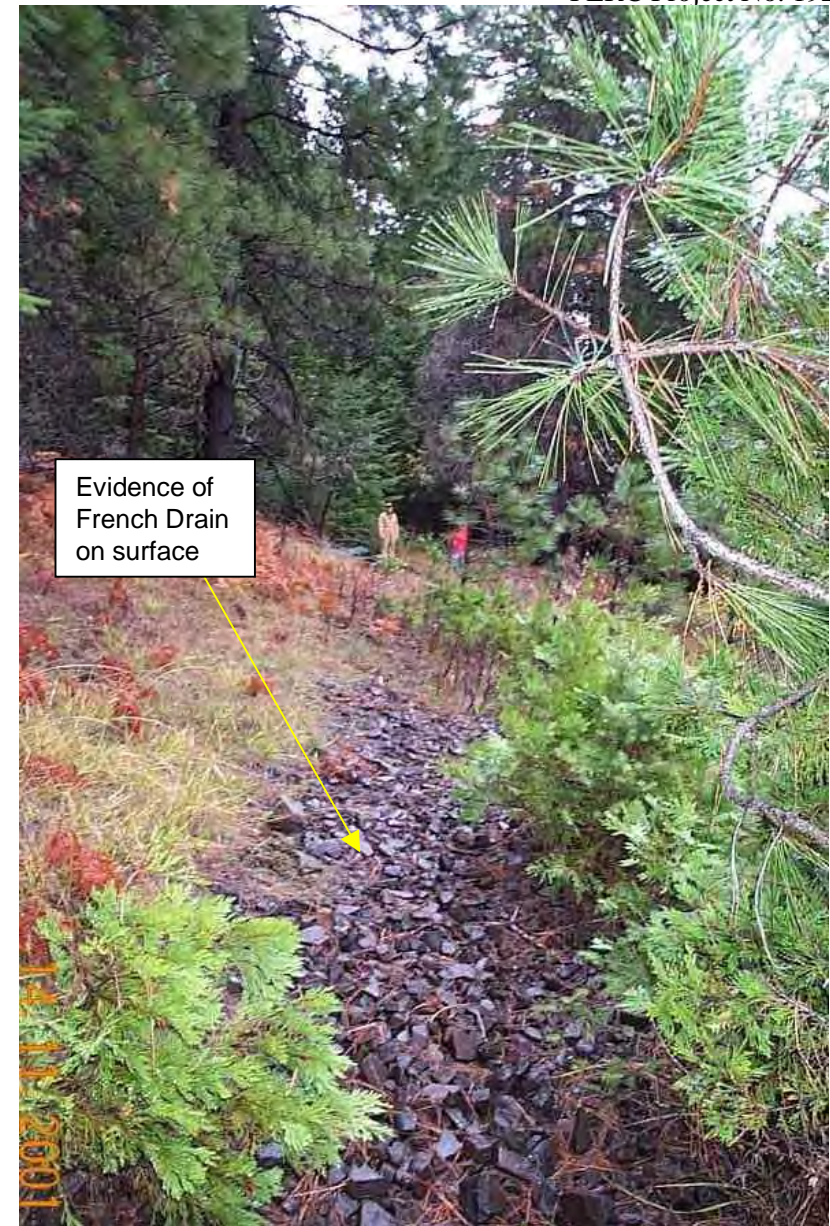
LM2-6 Site Photos

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Picture taken up-slope of bulge in the canal.

Squier Associates studied this site prior to installation of geomembrane and gunite canal repair in the fall of 1997. Reports were issued by Squier Associates in Aug and Nov of 1997 in which possible mitigation options were examined. The chosen options was to clean out the surface drainage system.

The picture shows surface evidence of French Drain that was reported in the Squiers Report to have been installed in the 1960s.

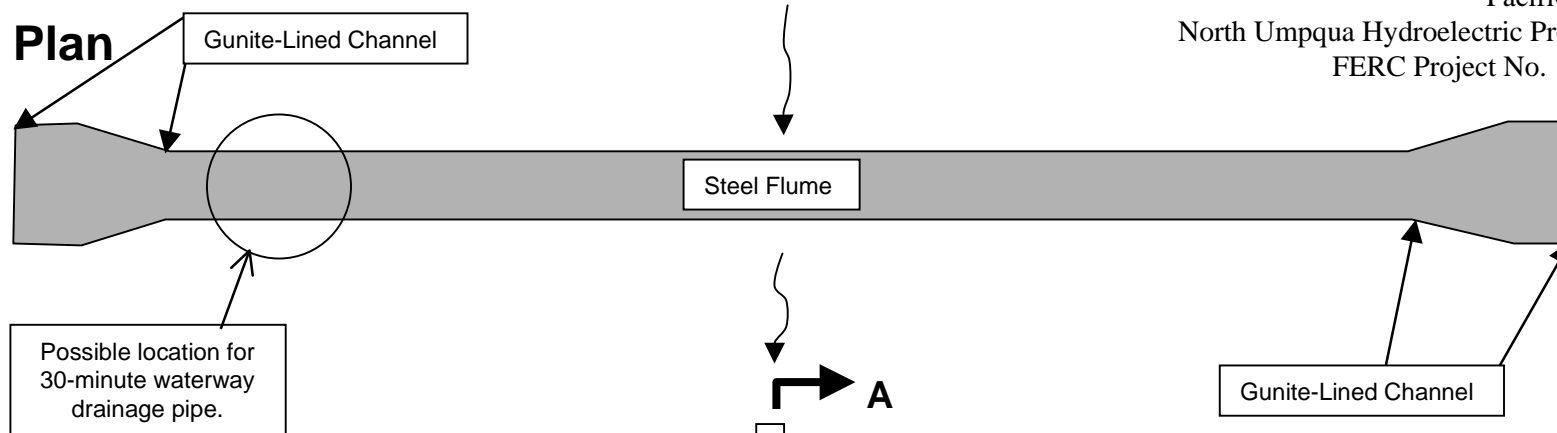


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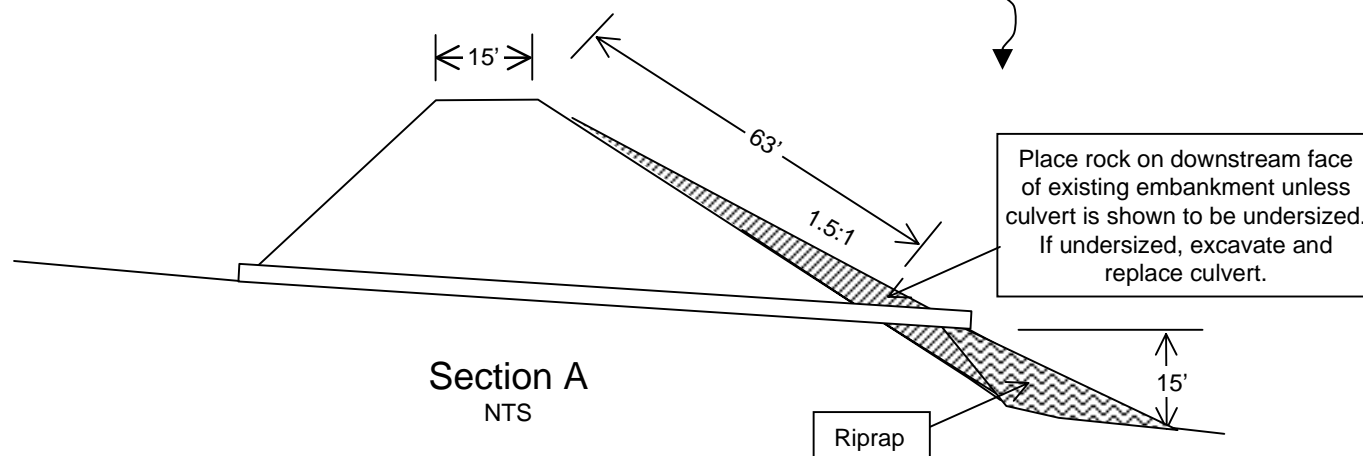
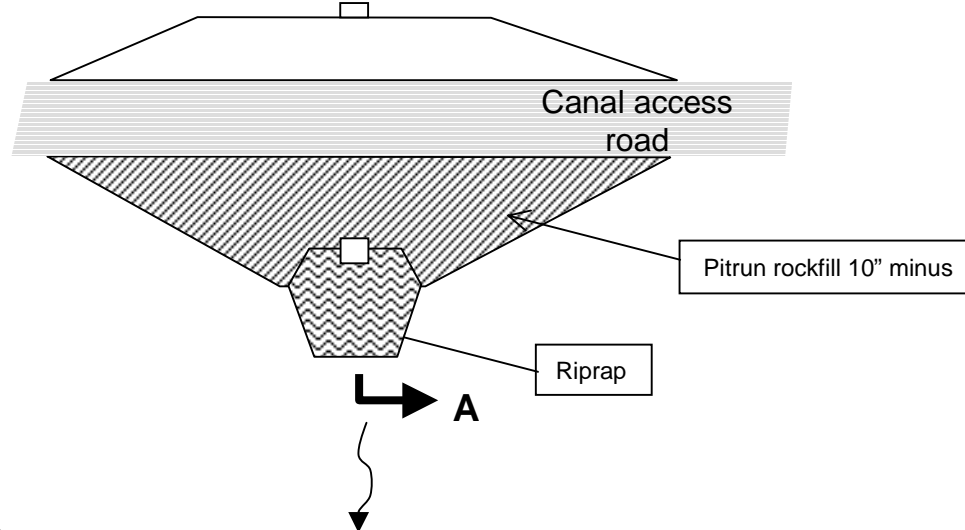
Site #	LM2-7		Priority Ranking	Med		Locator Information/GPS		
			Impact Rating	1		GPS reports 28 ft accuracy		
			Risk Rating	3		Start	Lat:	Long:
Project Development:		Lemolo 2				Reference Point	43' 19.240"	122' 20.800"
Nearest Project Feature:		Waterway	Structure Type:		Access Road, Culvert	End		
Description of Concern: Embankment fill oversteepened on downstream side. Culvert shotgunned above downstream toe of embankment.								
Proposed Remediation: Flatten downstream face of embankment by placing additional fill. Place additional fill and rock to bring toe of slope up to meet culvert. Culvert capacity to be verified, if adequate, do not replace.								
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches		
Buttress Fill						<p>Proposed location for 30-minute waterway drainage pipe. Additional engineering investigations and designs to be completed for drainage pipes. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments.</p> <p>Methods for placement of riprap on downstream face to be determined during final design, but may include benching and layer placement, end dumping, clamshell or other methods.</p>		
Clear slope		4,500	SF					
Waste Disposal		10	CY					
Pitrun rockfill 10" minus		370	CY					
Riprap 1.5'-3' rock		12	CY					
Data Collection Information:						Mass Bal	Borrow	CY
Team:	Robb Barr, Hanek, Moen, Hansen	Weather:	Overcast, 45 degrees				Excess Fill	CY
Date:	14-Nov-01	Time:	10:00am				Waste	10 CY

LM2-7 Site Plan

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The remediation planned is based on the assumption that the culvert is adequately sized for minimum of 100 year flood flow.



LM2-7 Site Photos

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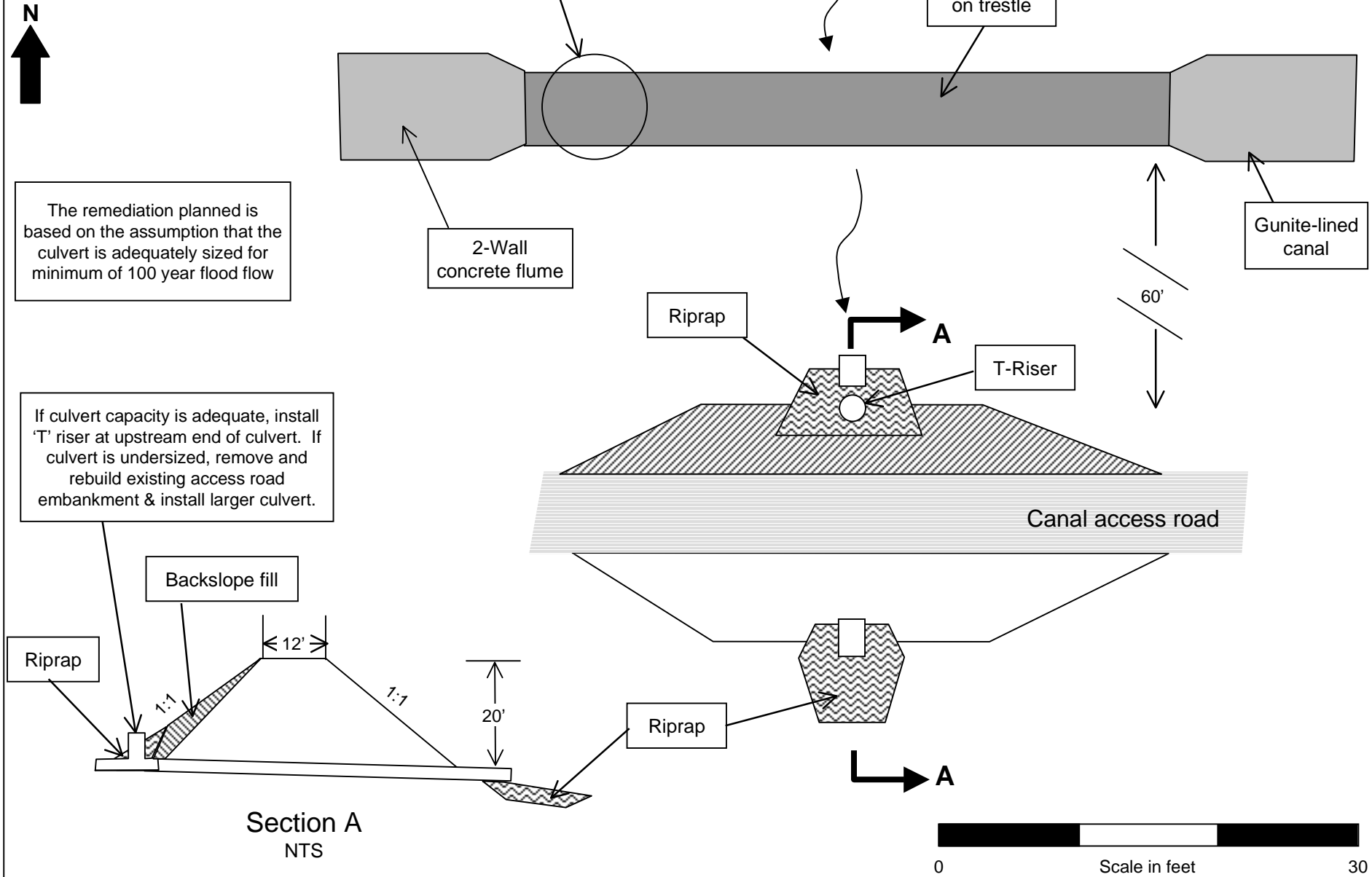


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Site #	LM2-8		Priority Ranking	High		Locator Information/GPS		
			Impact Rating	3		GPS reports 28 ft accuracy		
			Risk Rating	3		Start	Lat:	Long:
Project Development:		Lemolo 2				Reference Point	43' 19.530"	122' 19.839"
Nearest Project Feature:		Waterway	Structure Type:		Access Road, Culvert	End		
Description of Concern: Alvin Creek stream crossing - potential for plugging of culvert causing overtopping of and erosion of embankment fill. Shotgun culvert on downstream side of embankment with scour beneath culvert outlet								
Proposed Remediation: Assuming culvert capacity is adequate, install slotted T riser pipe on upstream end of culvert. If culvert is undersized and requires replacement, replace culvert and rebuild embankment with larger diameter rock.								
Remediation Task Breakdown:			Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches	
							Detail for slotted "T" section attached. Place riprap around riser and to fill scour hole at culvert outlet.	
Improvement to culvert Inlet								
One new slotted "T" section			1	EA				
Waste Disposal			10	CY				
Bankslope fill (from stockpile)			60	CY				
Riprap 1.5'-3' rock			20	CY				
Slope Revegetation								
Jute Matting			1,000	SF				
Revegetation			1,000	SF				
Data Collection Information:						Mass Bal	Borrow	60 CY
Team:	Robb Barr, Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees			Excess Fill	CY
Date:	14-Nov-01		Time:	10:30am			Waste	10 CY

LM2-8 Site Plan Alvin Creek

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LM2-8 Site Photo Alvin Creek

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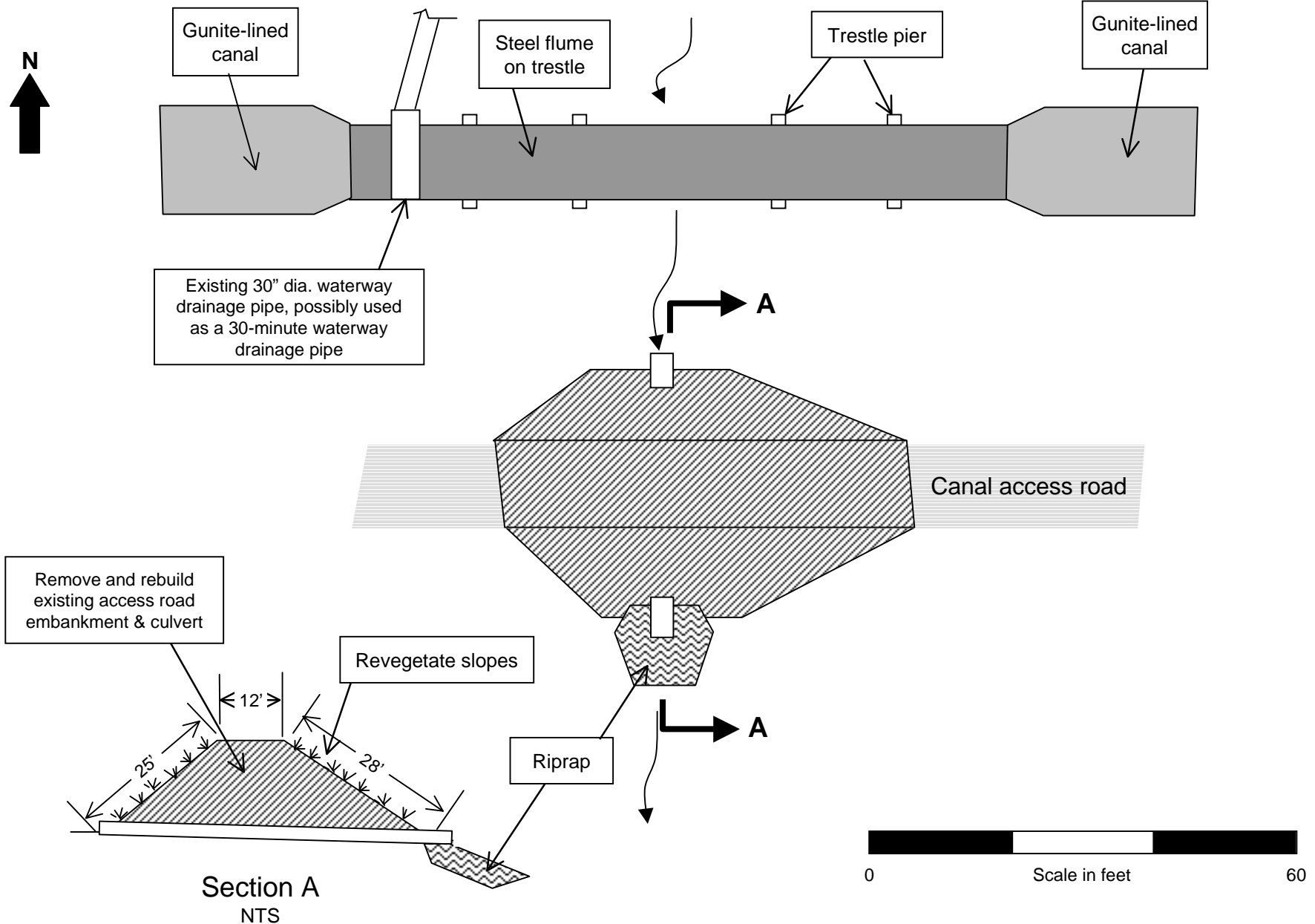
Inlet side of culvert.

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Site #	LM2-9		Priority Ranking	Med		Locator Information/GPS			
			Impact Rating	3		GPS shows 20' accuracy			
			Risk Rating	1		Start	Lat:	Long:	
Project Development:		Lemolo 2				Reference Point	43' 19.557"	122' 19.691"	
Nearest Project Feature:		Waterway	Structure Type:	Access Road, Culvert		End			
Description of Concern: Existing embankment for access road is oversteepened and raveling. Embankment made up of miscellaneous debris and fill. Downstream side of embankment is largely unvegetated. 24-inch culvert in existing embankment. Trestle flume has 30-inch drain pipe that is used for dewatering of canal seepage during maintenance periods.									
Proposed Remediation: Replace access road embankment with new embankment constructed in present location or on upstream side of existing embankment. Install new culvert sized for Q100 flow. Site is also a proposed location for a 30-minute drainage structure. Drainage structure design may examine potential use of existing 30-inch diameter pipe.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
						Additional engineering investigations and designs to be completed for drainage pipes. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may include additional erosion control measures. Areas where ground is disturbed by construction will be protected with jute mats or other comparable erosion control measures until vegetation planting or other ground cover is provided in accordance with the VMP.			
Culvert Crossing									
Excavation of existing crossing		640	CY						
Waste Disposal		10	CY						
Fill from stockpile		800	CY						
Fill material imported from other sites		170	CY						
Roadbed material 1" minus pitrun		10	CY						
New 36" culvert		75	FT						
Pipe Bedding		20	CY						
Riprap 1.5'-3' rock		12	CY						
Slope Revegetation									
Jute Matting		2,000	SF						
Revegetation		2,000	SF						
Data Collection Information:						Mass Bal	Borrow	170	CY
Team:	Robb Barr, Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees			Excess Fill		CY
Date:	14-Nov-01		Time:	11:30am			Waste	10	CY

LM2-9 Site Plan

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LM2-9 Site Photos

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Outlet side of culvert. Over
steep raveling slopes



Steel flume section at inlet
side of culvert. Channel
protection to be provided at
outlet to canal drainage pipe

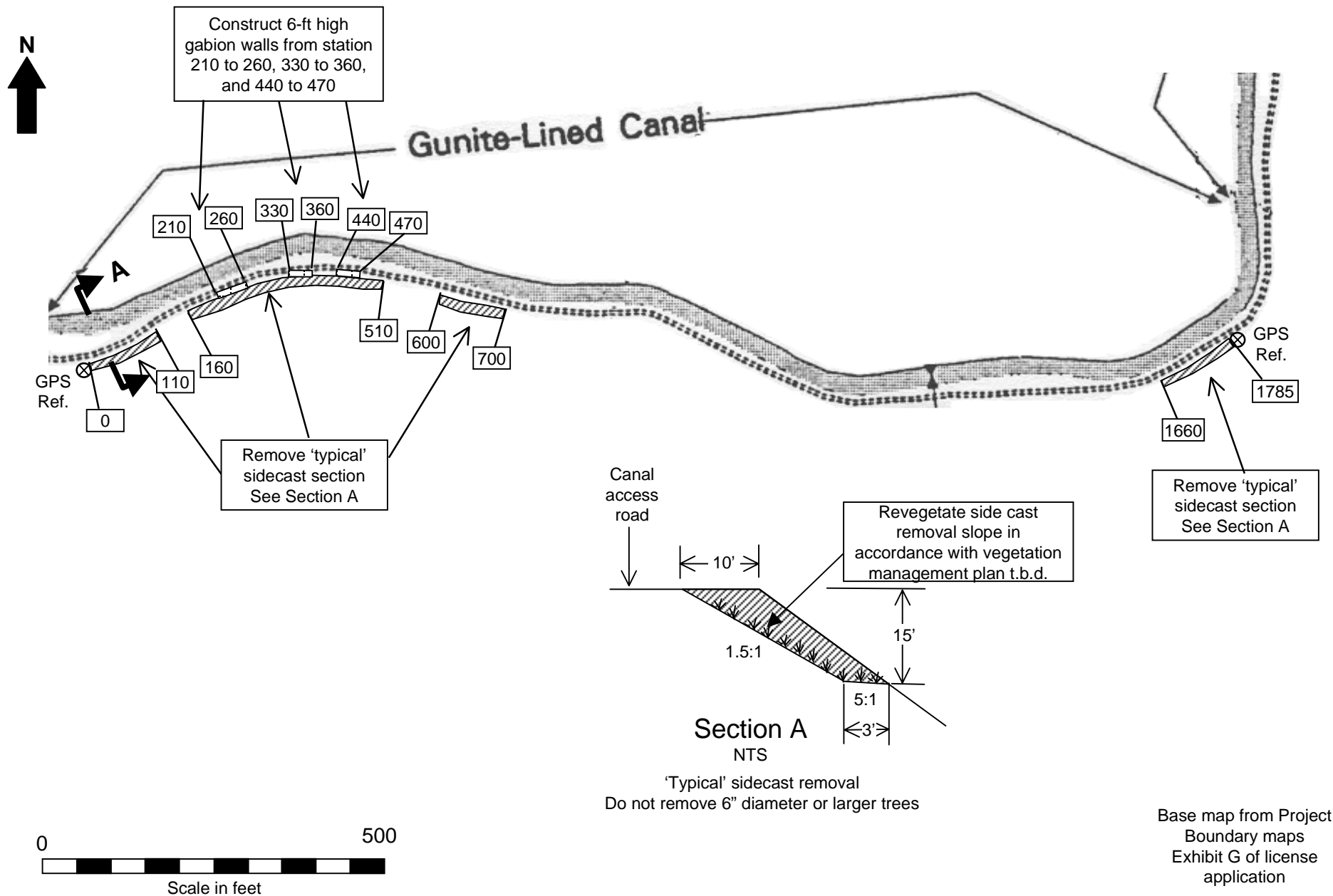


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Site # LM2-10		Priority Ranking	Med	Low		Locator Information/GPS			
		Impact Rating	2	2		GPS shows 35' accuracy			
		Risk Rating	2	1		Start Lat: 43' 19.753" Long: 122' 19.330"			
Project Development:		Lemolo 2				Reference Point			
Nearest Project Feature:		Waterway	Structure Type:		Access Road, Slope	End Lat: 43' 19. 607" Long: 122' 19.587"			
Description of Concern: Sidecast has been placed on downslope side of access road. Many areas are relatively stable and have well-developed vegetation, but selected areas are oversteepened and could potentially fail.									
Proposed Remediation: Selectively remove sidecast from oversteepened areas. Do not remove any established trees. Remove sidecast from four areas within this approximate 1,800 foot segment. Construct approximately 110 ft of 6-ft high gabion walls, at locations shown on site map. See sketch map.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
						Areas where ground is disturbed by construction will be protected with jute mats or other comparable erosion control measures until vegetation planting or other ground cover is provided in accordance with the VMP. Slope above canal has potential for some boulders to roll towards canal, however this is considered a low hazard. Mitigation to be provided through installation of 30-minute waterway drainage system.			
Sidecast Removal									
Excavation		2,500	CY						
Use as padding material (or stockpile)		2,250	CY						
Waste disposal		250	SF						
Gabion Wall 6'x110'									
Excavate for tie backs		200	CY						
Spread compact backfill		150	CY						
Use as padding material (or stockpile)		50	CY						
Place wire mesh tie-backs		990	SF						
Place gabion baskets 6' high		110	LF						
Stone fill in baskets		70	CY						
Slope Revegetation									
Jute Matting		21,000	SF						
Revegetation		21,000	SF						
Data Collection Information:						Mass Bal	Borrow		CY
Team:	Robb Barr, Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees		Excess Fill	2,300	CY	
Date:	14-Nov-01		Time:	1:00pm		Waste	250	CY	

LM2-10 Site Plan

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LM2-10 Site Photo

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Photo of 'typical'
sidecast removal
section. Limited areas
of over steep slopes
with heavy vegetation.

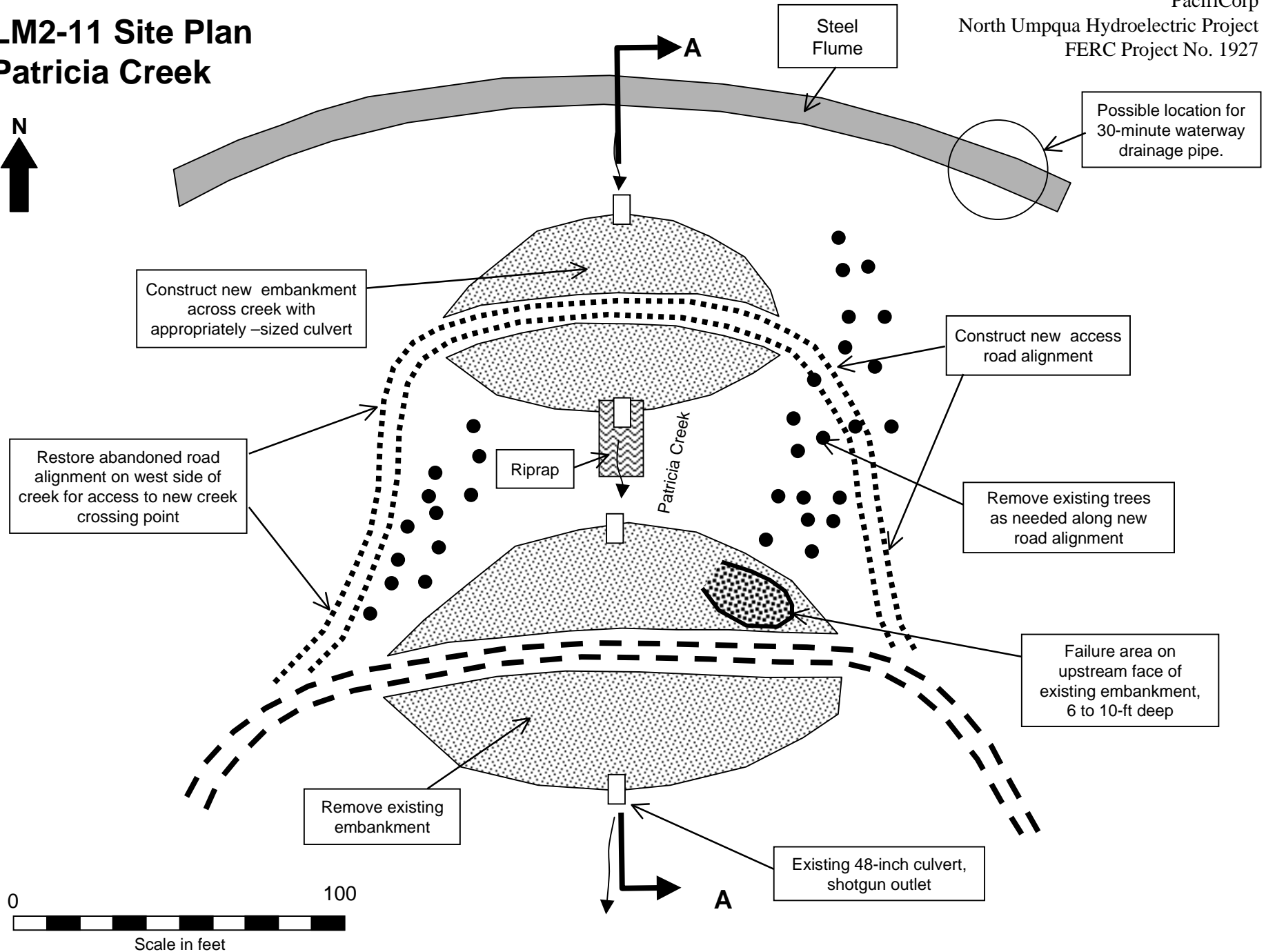


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Site #	LM2-11		Priority Ranking	High		Locator Information/GPS			
			Impact Rating	3		GPS shows 47' accuracy			
			Risk Rating	3		Start	Lat:	Long:	
Project Development:		Lemolo 2				Reference Point			
Nearest Project Feature:		Waterway	Structure Type:		Access Road, Culvert	End			
Description of Concern: Existing roadway embankment over Patricia Creek is failing. Recent slump on upstream side of embankment has formed a 15-foot wide, 10-foot deep failure. Raveling and oversteepened slopes are present on the downstream side of the embankment. Culvert is shotgunned on downstream side of embankment.									
Proposed Remediation: Replace with a new embankment located upstream of the existing. Upstream toe of existing embankment is located 125 ft from trestle structure, leaving adequate room for a new embankment. New embankment can be lower than existing, see sketch.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
						This site is also a proposed location for a 30-minute waterway drainage pipe. Additional engineering investigations and designs to be completed for drainage pipes. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments.			
Culvert Crossing									
Excavation of existing crossing		3,000	CY						
Waste Disposal		100	CY						
Fill from stockpile		2,000	CY						
Excess fill to stockpile		900	CY						
Roadbed material 1" minus pitrun		40	CY						
New 60" culvert		100	LF						
Pipe Bedding		30	CY						
Riprap 1.5'-3' rock		15	CY						
Slope Revegetation									
Jute Matting		7,000	SF						
Revegetation		7,000	SF						
Data Collection Information:						Mass Bal	Borrow		CY
Team:	Robb Barr, Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees			Excess Fill	900	CY
Date:	14-Nov-01		Time:	1:00pm			Waste	100	CY

LM2-11 Site Plan Patricia Creek

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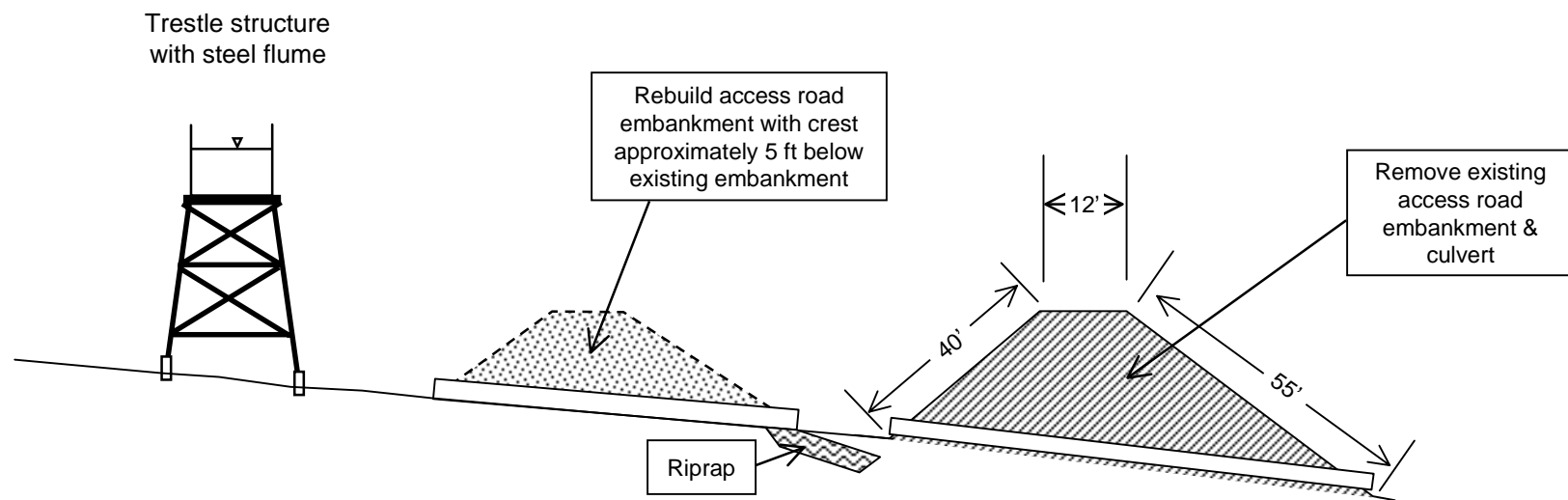


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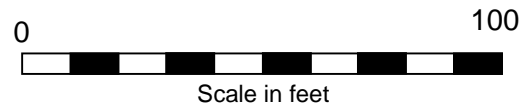
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LM2-11 Site Plan Patricia Creek

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Section A



LM2-11 Site Photo Patricia Creek

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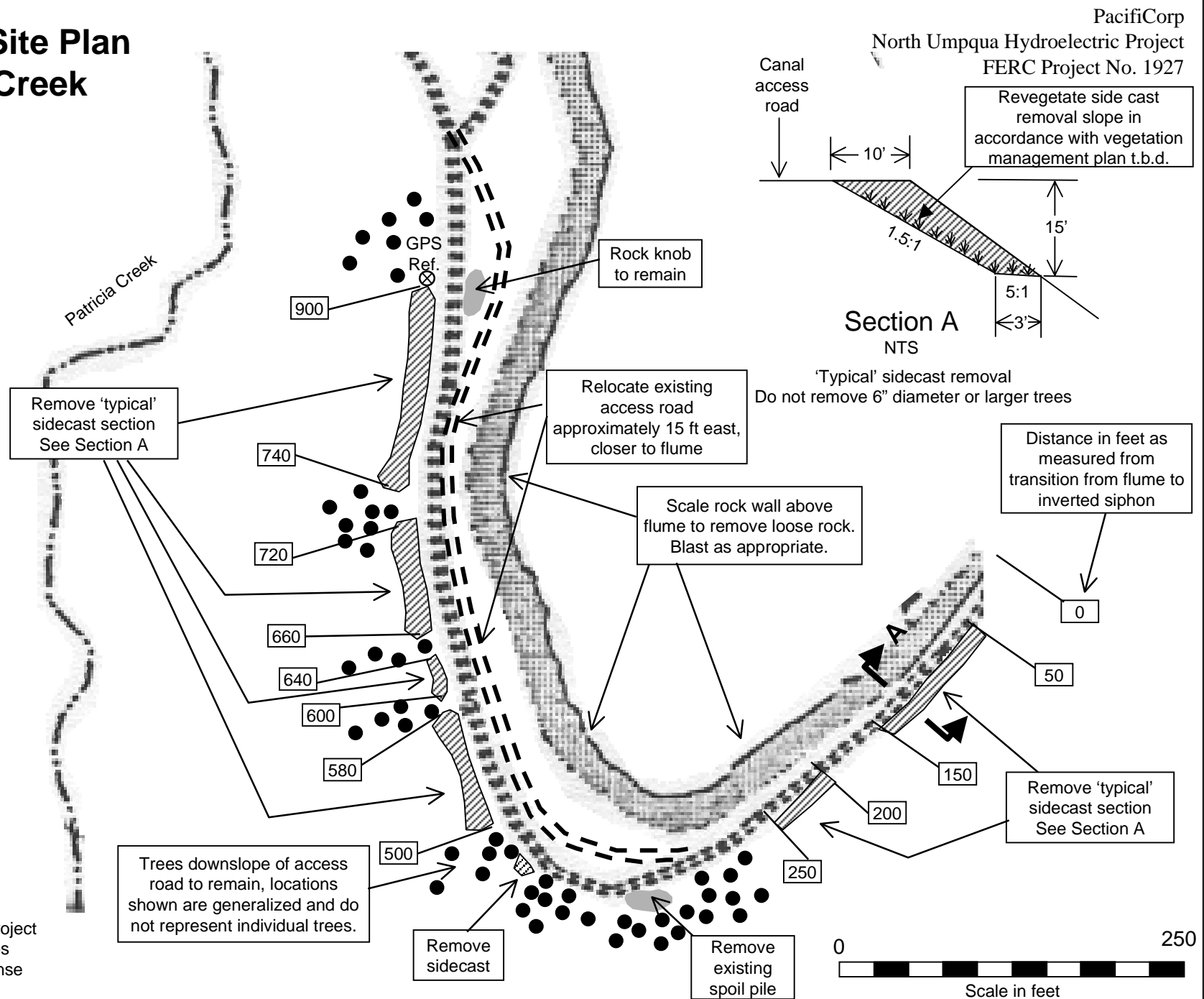


View of slope
failure on
upstream side of
culvert
embankment.

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Site #	LM2-12		Priority Ranking	High		Locator Information/GPS			
			Impact Rating	3		Start	Lat: 43' 19.789"	Long: 122' 19.123"	
Project Development:	Lemolo 2		Risk Rating	3		Reference Point			
Nearest Project Feature:	Waterway	Structure Type:	Access Road, Canal			End			
Description of Concern: Canal east of Patricia Creek crossing is single wall flume. Twenty to thirty-foot high rock walls on inboard side of canal. Rock is slumping into canal and constricting flow. Past failures have damaged canal wall and caused spillage. Several large failures in sidecast slopes below canal, on east side of Patricia Creek. See photo.									
Proposed Remediation: Shift access road to east, closer to canal wall. This will allow removal of upper prism of sidecast and lessen chance for future failures. Remove sidecast selectively, not disturb areas where larger trees are established. Scale rock wall above canal, or conduct controlled blasting every five years to remove rock that could fail and impact the canal.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
Sidecast Removal						Prior to construction of erosion mitigation measures, agency personnel will review draft designs as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments. Areas where ground is disturbed will be protected with jute mats or other comparable erosion control measures until vegetation planting or other ground cover is provided in accordance with the VMP.			
Excavation	1,800	CY							
Use as padding material (or stockpile)	1,650	CY							
Waste Disposal	150	SF							
Regrade Access Road									
Road Grader	8	HR							
Slope Scaling									
Cherry Picker	16	HR							
Load & Haul to waste scaled material	20	CY							
Slope Revegetation									
Jute Matting	16	SF							
Revegetation	20	CY							
Data Collection Information:						Mass Bal	Borrow		CY
Team:	Robb Barr, Hanek, Moen, Hansen	Weather:	Overcast, 45 degrees				Excess Fill	1,650	CY
Date:	14-Nov-01	Time:	1:00pm				Waste	170	CY

LM2-12 Site Plan Patricia Creek



LM2-12 Site Photos Patricia Creek

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Small rockslide into
canal near Patricia
Creek



Views of 'typical'
sidecast section



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Site #	LM2-13		Priority Ranking	Med	Med		Locator Information/GPS			
			Impact Rating	2	2		Start	Lat: 43' 19.801"	Long: 122' 19.139"	
Project Development:	Lemolo 2		Risk Rating	2	2		Reference Point			
Nearest Project Feature:	Waterway	Structure Type:	Access Road Slope, Canal Slope				End			
Description of Concern: Site starts at west end of Sag Pipe structure. Large slumps and rockfalls are occurring in slope above wall.. Rock is highly variable, brecciated and extensively fractured, making effective stabilization virtually impossible. Downslope side of road has sidecast with grass and brush vegetation.										
Proposed Remediation: Continue current PacifiCorp practice of selective scaling of large boulders that appear ready to fail. Remove rockfall debris from road surface as part of ongoing project maintenance. Monitor sidecast on downslope side of road for signs of failure. Provide remedial action if needed to maintain road.										
Remediation Task Breakdown:			Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
Slope Scaling										
Cherry Picker			16	HR						
Load & Haul to waste scaled material			20	CY						
Data Collection Information:							Mass Bal	Borrow		CY
Team:	Robb Barr, Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees				Excess Fill		CY
Date:	14-Nov-01		Time:	3:00pm				Waste	20	CY

LM2-13 Site Photos Sag Pipe Area

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View of rock face above access road over Sag Pipe.

No remediation planned -
Continue PacifiCorps practice of
selective scaling of large boulders
that are ready to fall. Remove rock
that ravel from rock face above
road.

Monitor down-slope for signs of
instability. Provide remedial action
if needed to maintain road

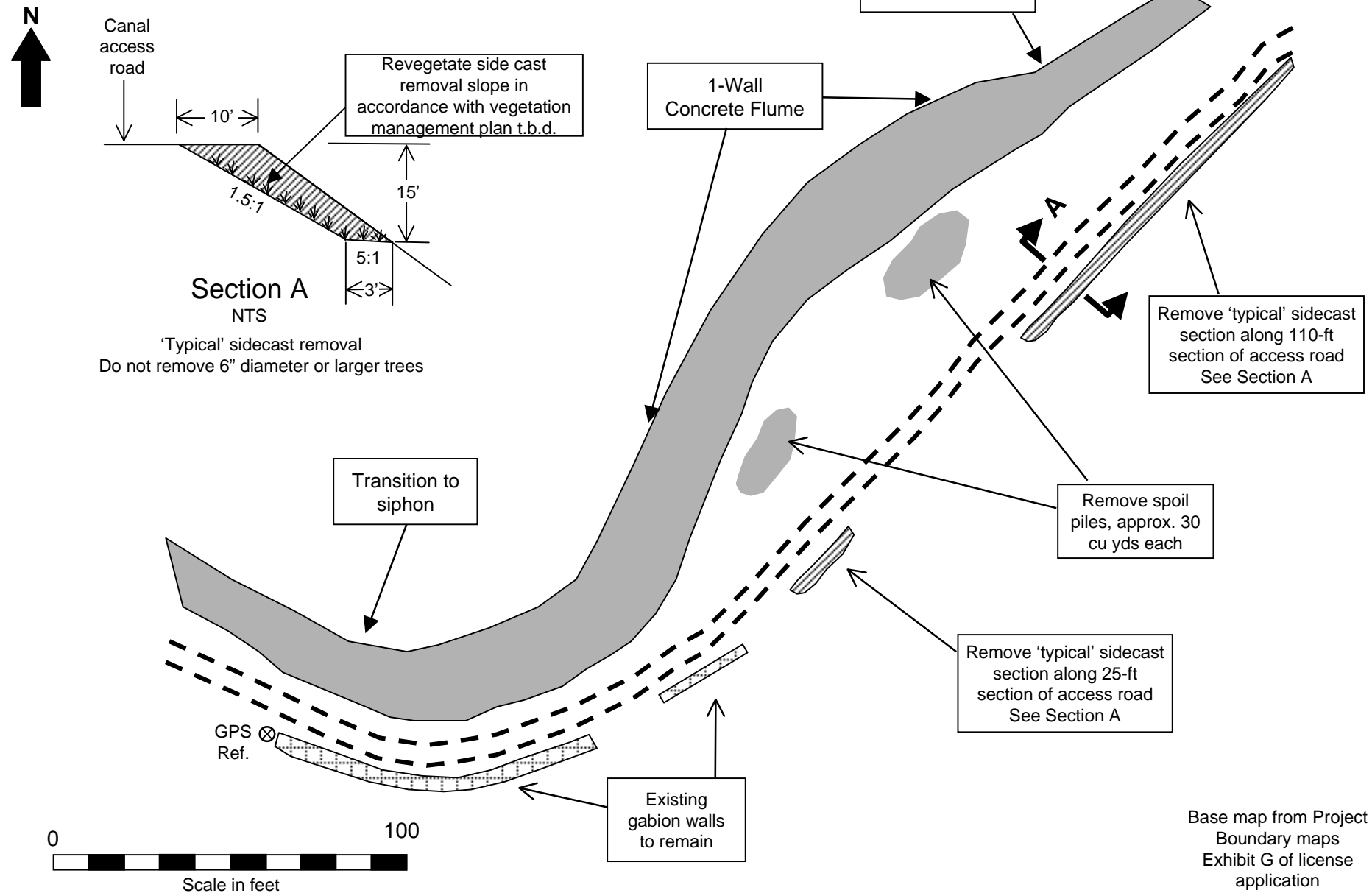


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Site Remediation/Assessment Form

Site #	LM2-14		Priority Ranking	High		Locator Information/GPS			
			Impact Rating	2		Lat:		Long:	
			Risk Rating	3		Start	43' 19.902"	122' 19.050"	
Project Development:		Lemolo 2	Structure Type:		Access Road & Canal	Reference Point			
Nearest Project Feature:		Waterway				End			
Description of Concern: Sidecast in area between east end of Sag Pipe and the Sag Pipe spill structure is locally oversteepened and may fail. Portions of this 235-foot long area have well-developed vegetation in place.									
Proposed Remediation: Selectively remove sidecast is areas that are most prone to failure. Do not remove sidecast in any area with large trees. See sketch map for areas where sidecast should be removed.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
Sidecast Removal						Areas where ground is disturbed will be protected with jute mats or other comparable erosion control measures until vegetation planting or other ground cover is provided in accordance with the VMP.			
Excavation		500	CY						
Use as Padding Material (or stockpile)		450	CY						
Waste disposal		50	SF						
Spoil pile removal & disposal to waste		60	CY						
Slope Revegetation									
Jute Matting		4,200	SF						
Revegetation		4,200	SF						
Data Collection Information:						Mass Bal	Borrow		CY
Team:	Robb Barr, Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees			Excess Fill	450	CY
Date:	14-Nov-01		Time:	3:00pm			Waste	110	CY

LM2-14 Site Plan

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Site #	LM2-15		Priority Ranking	High		Locator Information/GPS			
			Impact Rating	2		GPS shows 38' accuracy	Lat:	Long:	
			Risk Rating	3		Start	43' 19.927"	122' 19.022"	
Project Development:		Lemolo 2				Reference Point			
Nearest Project Feature:		Spillway Structure	Structure Type:		Access Road & Canal	End			
Description of Concern: Sag Pipe spill structure channels water into a 6-ft diameter CMP culvert and directs it downslope approximately 100 feet. Discharge from the bottom of the CMP pipe has eroded a channel into the slope below. Concern existing regarding the potential to cause further erosion in this channel, which leads directly to the North Umpqua river.									
Proposed Remediation: Field inspection of the area at the bottom of the culvert shows that the culvert has eroded a channel down to bedrock. Little further erosion is likely to occur. No action planned at this site. Monitor site and inspect channel on an annual basis.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
NA						Aquatic connectivity site L26 lies within the area of this site. Issues related to future modifications planned to restore aquatic connectivity at this site have not been taken into account in evaluating erosion mitigation measures at this site. Final design of aquatic connectivity measures at this site may result in modifications to the present no action alternative for erosion mitigation. Proposed location for 30-minute waterway drainage pipe lies within this site. Additional engineering investigations and designs to be completed for drainage pipes. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may also result in modifications to the present no action alternative for erosion mitigation.			
Data Collection Information:						Mass Bal	Borrow		CY
Team:	Robb Barr, Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees			Excess Fill		CY
Date:	14-Nov-01		Time:	3:00pm			Waste		CY

LM2-15 Site Photos Sag Pipe Spillway Structure

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North Umpqua Hydroelectric Project
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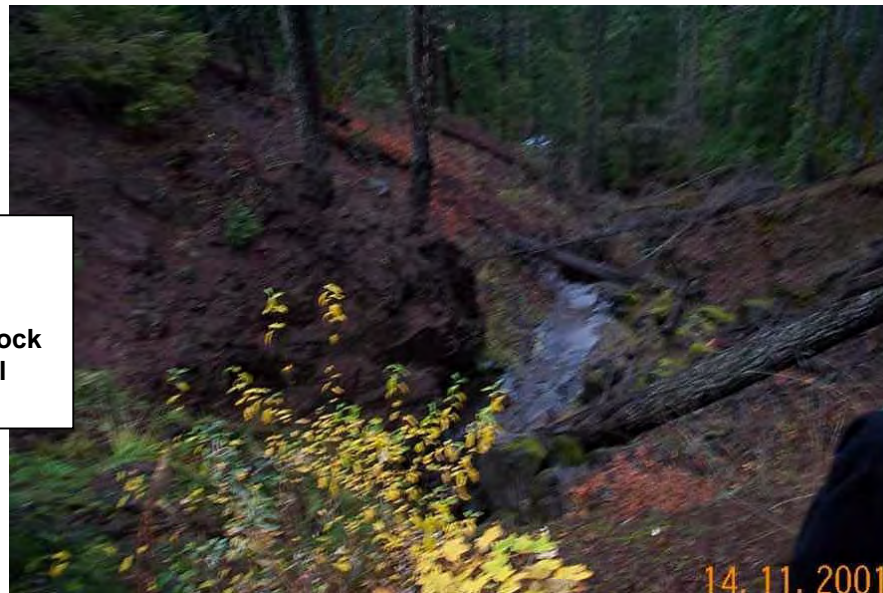
View of Sag Pipe Spillway.

No remediation planned -
developing access to bottom of
spillway drainage pipe would
cause significantly more
damage than existing condition



**View of Sag Pipe Spillway
discharge.**

The pipe discharge is into a rock
channel below – no additional
erosion likely.

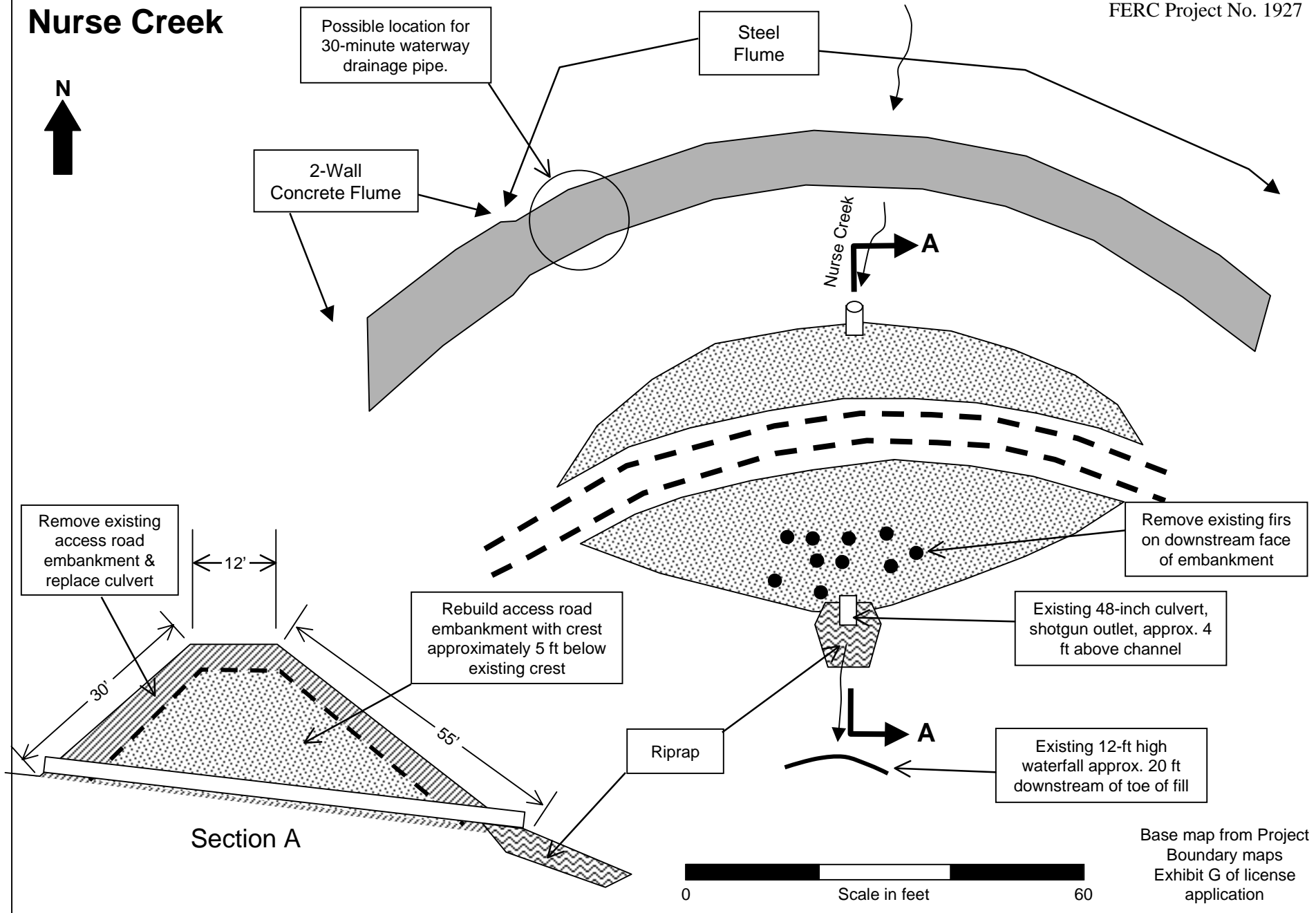


North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/Assessment Form

Site #	LM2-17		Priority Ranking	High	High		Locator Information/GPS		
			Impact Rating	3	3		GPS shows 27' accuracy		
			Risk Rating	2	2		Start	Lat:	Long:
Project Development:		Lemolo 2					Reference Point	43' 20.200"	122' 18.484"
Nearest Project Feature:		Waterway	Structure Type:			Access Road & Culvert	End		
Description of Concern: Poor drainage on road surface, water drains from road surface onto downstream face of embankment. Downstream face has well established vegetation - 30+year Douglas firs. Culvert in embankment is rusted and bottom can be punctured with a hammer, top in better condition. Culvert is older riveted type.									
Proposed Remediation: Install new culvert and rebuild embankment. Lower road grade by approximately 5 ft to reduce amount of fill needed and height of embankment.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
						Site is at Nurse Creek.			
Culvert Crossing						Proposed location for 30-minute waterway drainage pipe lies within this site. Additional engineering investigations and designs to be completed for drainage pipes. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments.			
Excavation of existing crossing		2,600	CY						
Waste Disposal		200	CY						
Fill from stockpile		2,200	CY						
Excess fill to stockpile		200	CY						
Roadbed material 1" minus pitrun		12	CY						
New 60" culvert		95	FT						
Pipe Bedding		30	CY						
Riprap 1.5'-3' rock		15	CY						
Slope Revegetation									
Jute Matting		3,500	SF						
Revegetation		3,500	SF						
Data Collection Information:						Mass Bal	Borrow		CY
Team:	Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees			Excess Fill	200	CY
Date:	15-Nov-01		Time:	10:00am			Waste	200	CY

LM2-17 Site Plan Nurse Creek

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LM2-17 Site Photos Nurse Creek

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View of steel
flume on up-
slope side of
Nurse Creek



View of
Culvert Outlet



North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/Assessment Form

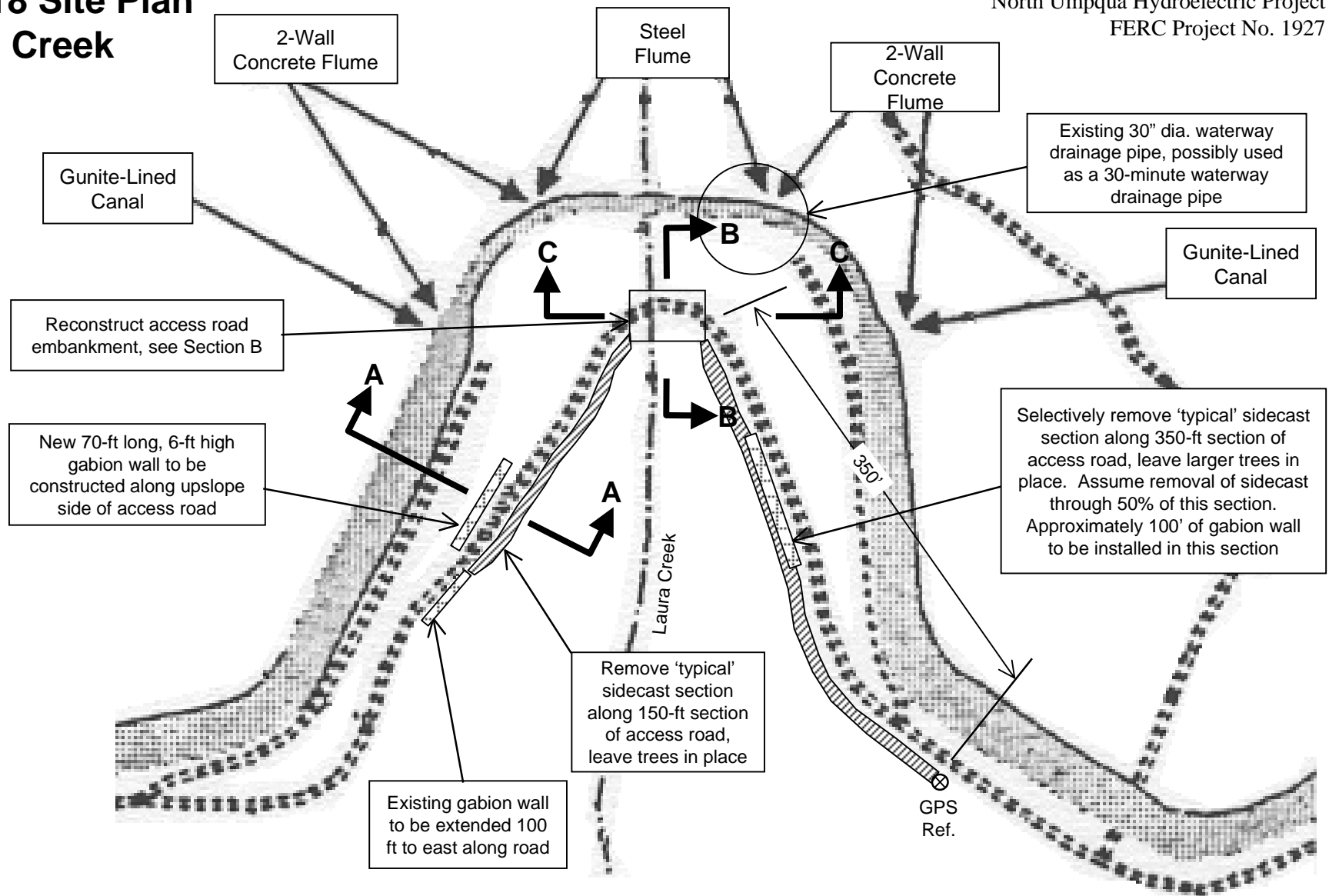
Site #	LM2-18		Priority Ranking	High	High		Locator Information/GPS		
			Impact Rating	3	3		GPS shows 46' accuracy		
			Risk Rating	2	2		Start	Lat:	Long:
Project Development:		Lemolo 2					Reference Point		
Nearest Project Feature:		Waterway	Structure Type:			Access Road & Culvert	End	43' 20.393"	122' 17.910"
Description of Concern: Potential fill failure, also has potential for plugging of upstream end of culvert, causing overtopping and fill failure. Poor draining on access road on both east and west side of fill, drainage is directed down road surface and onto embankment fill. Existing culvert is 48" diameter.									
Proposed Remediation: Install new culvert and rebuild embankment. Lower embankment crest by approximately five feet to reduce size of embankment. Install larger culvert. On access road west of fill remove approximately 200 ft section of oversteepened sidecast. Extend existing gabion wall approximately 100 ft. Install 70 ft of new 6 ft high gabion wall on upslope side to maintain road width. To east of fill, selectively remove sidecast in 350 ft section, and install 100 ft of gabion wall.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
Sidecast Removal						Site is at Laura Creek.			
Excavation		110	CY			Proposed location for 30-minute waterway drainage pipe lies within this site. Additional engineering investigations and designs to be completed for drainage pipes. These may examine the feasibility of using an existing 30-inch diameter drain pipe as part of the 30-minute drainage system. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may result in modifications to the dimensions and limit of the proposed treatments.			
Use as padding material (or stockpile)		100	CY						
Waste Disposal		10	CY						
Gabion Walls 6'x70', 6'x100', 3'x100'									
Excavate for tie backs		600	CY						
Spread compact backfill		480	CY			Areas where ground is disturbed by construction will be protected with jute mats or other comparable erosion control measures until vegetation planting or other ground cover is provided in accordance with the VMP.			
Use as padding material (or stockpile)		120	CY						
Place wire mesh tie-backs		3,300	SF						
Place gabion baskets 6' high		170	LF						
Place gabion baskets 3' high		100	LF						
Stone fill in baskets		210	CY						
Culvert Crossing									
Excavation of existing crossing		1,000	CY						
Waste Disposal		50	CY						
Fill from stockpile		300	CY						
Use as padding material (or stockpile)		650	CY						
(Cont. on next page)									
Data Collection Information:						Mass Bal	Borrow		CY
Team:	Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees			Excess Fill	870	CY
Date:	15-Nov-01		Time:	10:00am			Waste	60	CY

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/Assessment Form

Site # LM2-18 (Cont.)		Priority Ranking	High (4)	High (4)		Locator Information/GPS			
		Impact Rating	5	5		GPS shows 46' accuracy Lat: Long:			
		Risk Rating	3	3		Start			
Project Development:		Lemolo 2				Reference Point			
Nearest Project Feature:		Waterway	Structure Type:			Access Road & Culvert	End		
						43' 20.393" 122' 17.910"			
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
Culvert Crossing (Cont.)									
Roadbed material 1" minus pitrun		15	CY						
New 48" Culvert		95	FT						
Pipe Bedding		30	CY						
Riprap 1.5'-3' rock		12	CY						
Slope Revegetation									
Jute Matting		4,000	SF						
Revegetation		4,000	SF						
Data Collection Information:						Mass Bal	Borrow		CY
Team:	Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees		Excess Fill	870	CY	
Date:	15-Nov-01		Time:	10:00am		Waste	60	CY	

LM2-18 Site Plan Laura Creek

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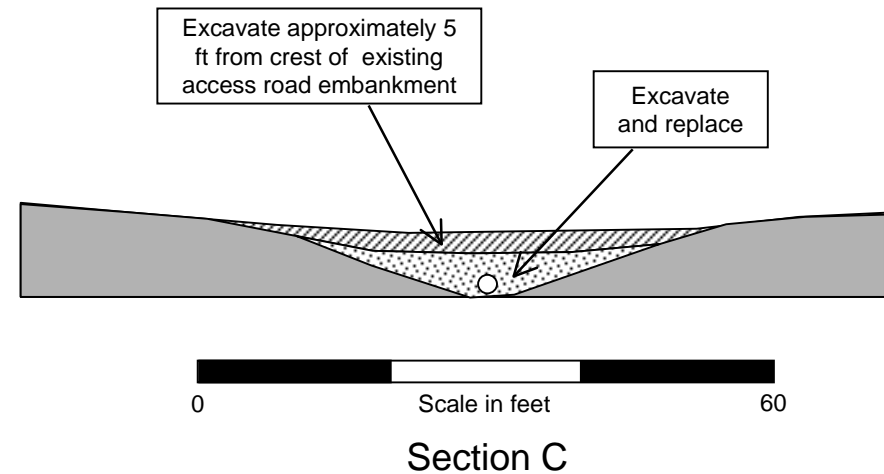
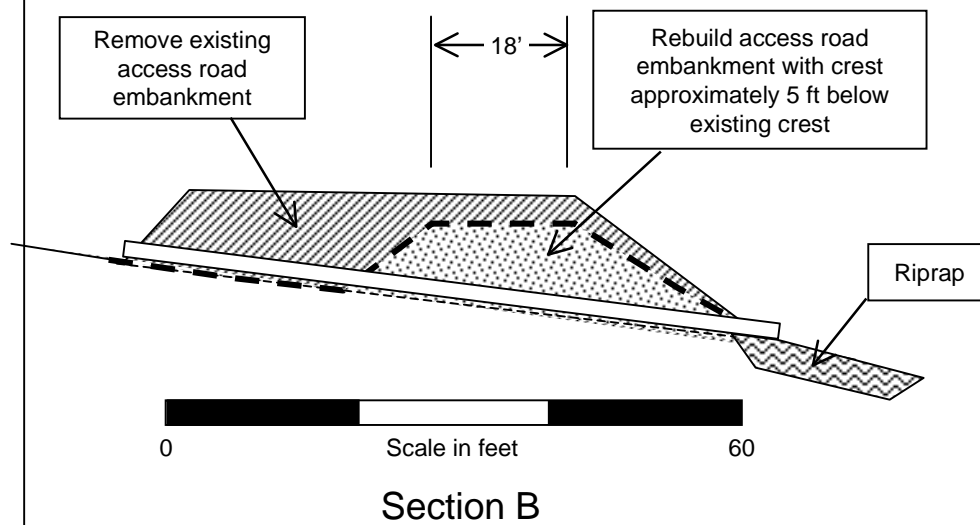
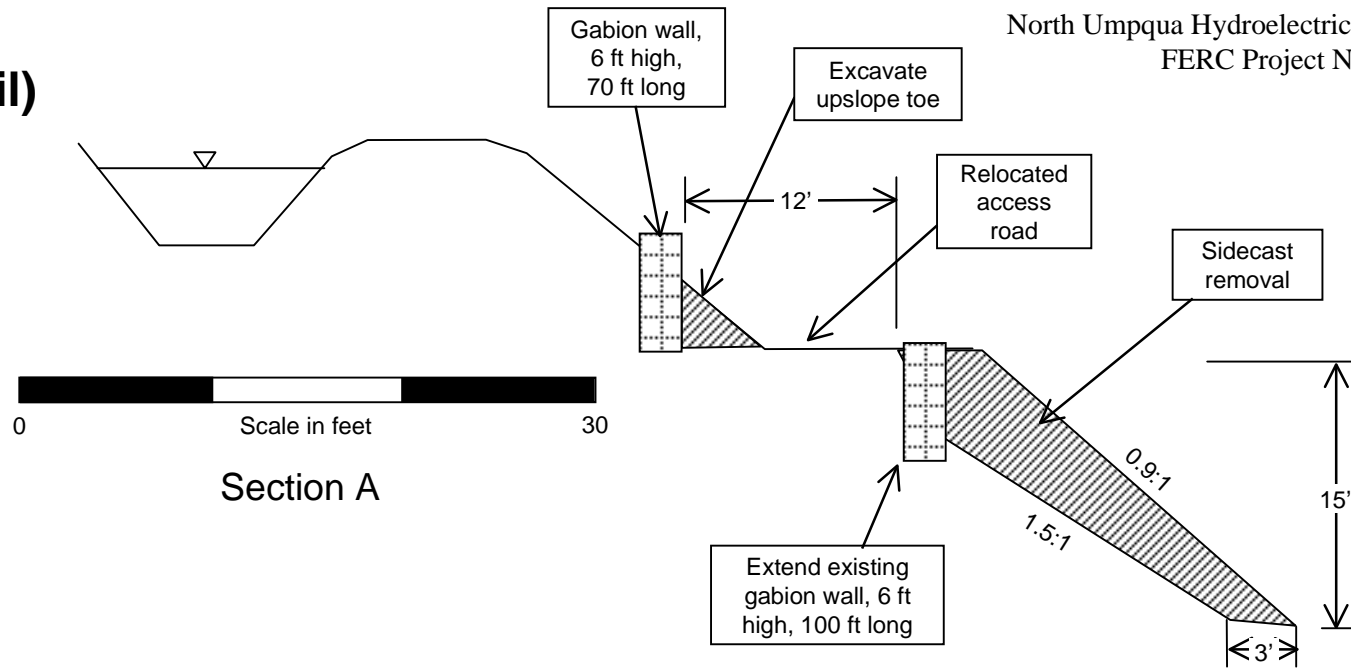
Base map from Project
Boundary maps
Exhibit G of license
application

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LM2-18 Site Plan Laura Creek (detail)

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Base map from Project
Boundary maps
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LM2-18 Site Photos Laura Creek

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View of Laura Creek
culvert and
embankment looking
North-Northeast

LM2-18 Site Photos Laura Creek

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North Umpqua Hydroelectric Project
FERC Project No. 1927



Over-steep slopes
below access road



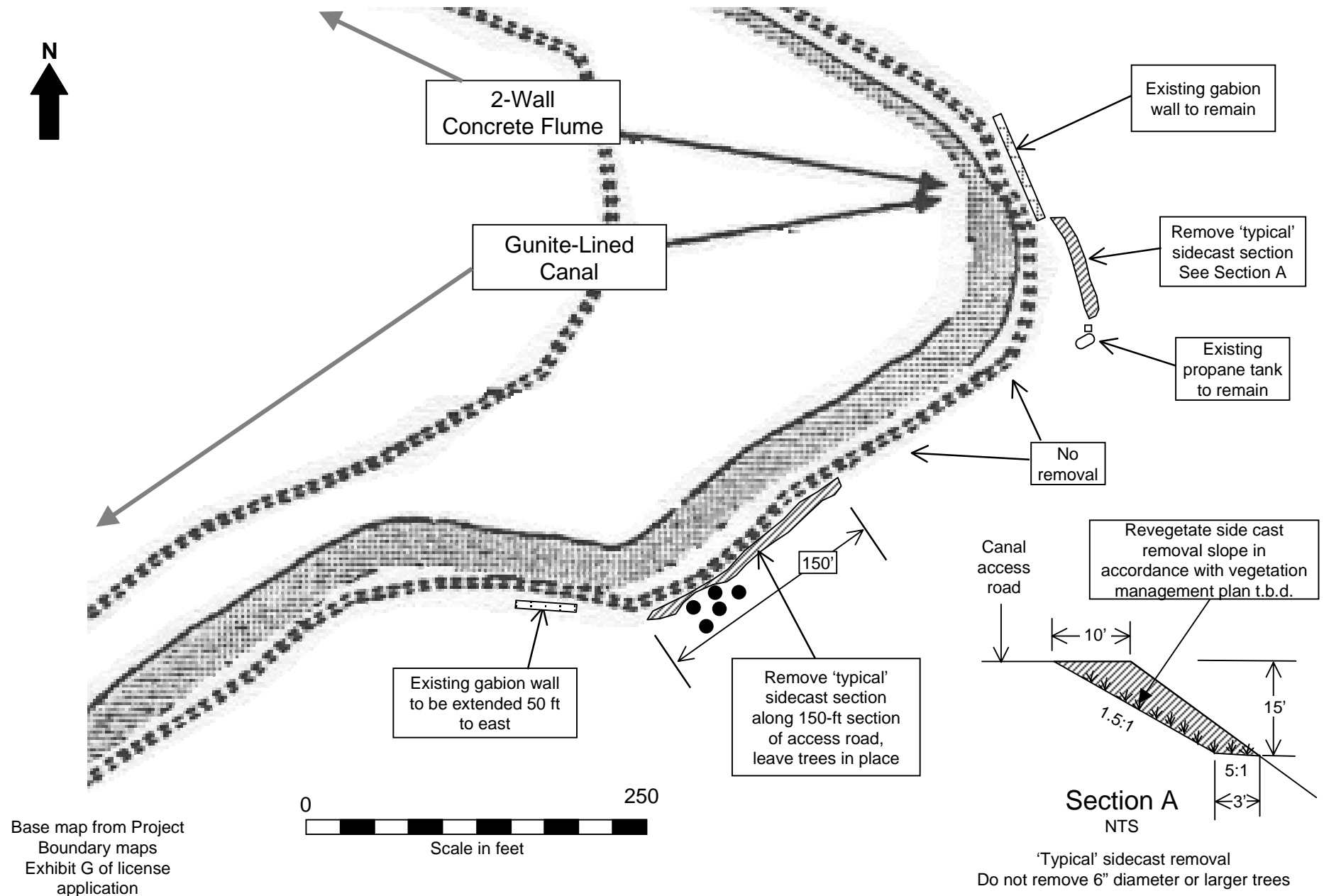
View of road along canal
looking upstream
towards Laura Creek

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	LM2-19		Priority Ranking	High		Locator Information/GPS		
			Impact Rating	2		GPS shows 21' accuracy	Lat:	Long:
			Risk Rating	3		Start	43' 20.494"	122' 17.773"
Project Development:		Lemolo 2	Structure Type:		Access Road	Reference Point		
Nearest Project Feature:		Waterway				End		
Description of Concern: Cutslope failures above canal and sidecast failures below. Site is west of Potter Creek.								
Proposed Remediation: Selectively remove sidecast from approximately 275 ft of access road, in areas shown on sketch. Extend existing gabion wall 50 feet further to the east. Gabion wall is located approximately 400 feet west of the transition between gunite lined canal and double wall concrete flume.								
Remediation Task Breakdown:			Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches	
Sidecast Removal							Leave 6" and larger diameter trees and their roots undisturbed. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments. Areas where ground is disturbed by construction will be protected with jute mats or other comparable erosion control measures until vegetation planting or other ground cover is provided in accordance with the VMP.	
Excavation			1,000	CY				
Use as padding material (or stockpile)			900	CY				
Waste disposal			100	SF				
Gabion Wall 3'x50'								
Excavate for tie backs			25	CY				
Spread compact backfill			10	CY				
Use as padding material (or stockpile)			15	CY				
Place gabion baskets 3' high			50	LF				
Stone fill in baskets			20	CY				
Slope Revegetation								
Jute Matting			4,200	SF				
Revegetation			4,200	SF				
Data Collection Information:						Mass Bal	Borrow	CY
Team:	Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees			Excess Fill	915 CY
Date:	15-Nov-01		Time:	10:00am			Waste	100 CY

LM2-19 Site Plan

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LM2-19 Site Photo

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View along canal at beginning of section with selective side cast removal. Pink stake indicates the start of the sidecast removal section.

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	LM2-20		Priority Ranking	High (5)		Locator Information/GPS		
			Impact Rating	5		GPS shows 24' accuracy	Lat:	Long:
Project Development:		Lemolo 2	Risk Rating	5		Start		
Nearest Project Feature:		Waterway	Structure Type:	Steel Flume, Canal, Spillway		Reference Point	43' 20.630"	122' 17.975"
Description of Concern: Potter Creek. Unstable slopes above and below canal on west side of creek. Potential for debris flows in Potter Creek channel. Erosion at end of gunite channel in Potter Creek below crossing of waterway flume. Potential for boulders rolling down west slope to bounce into canal and damage flume wall and/or cause overflow.								
Proposed Remediation: Place mesh on portion of slope above flume to reduce velocity of boulders rolling down slope. Remove sidecast for 400 ft length on west side of creek, install gabion wall (estimated height 9 ft) along entire 400 ft section. On uphill side of flume structure, place 3 ft high gabion wall to provide protection against boulder impact. Restore original channel in Potter Creek and remove gunite section (see sketch). Revegetate Disturbed slopes as needed.								
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches		
						Site is at Potter Creek		
Concrete Demolition						Aquatic connectivity site L23 is located within the area of this site. Issues related to future modifications planned to restore aquatic connectivity at this site have not been taken into account in evaluating the need for additional erosion mitigation measures. This is also a proposed location for a 30-minute waterway drainage pipe. Additional engineering investigations and designs to be completed for drainage pipes. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments.		
Potter Creek Diversion Dam		2	CY					
Gunite Channel Lining		220	CY					
Streambed Restoration								
Excavate channel		15,000	CY					
Excess fill to stockpile		14,000	CY					
Waste disposal		1,000	CY					
Restoration work (large wood, rocks)		23,000	SF					
Sidecast Removal (U/S & D/S Sections)								
Excavation		3,900	CY					
Use as padding material (or stockpile)		3,500	CY			Final design will also consider the need for upgrading the location where seepage crosses the access road to an engineered driveable dip.		
Waste disposal		400	CY					
Rockfall Fence								
Rockfall Fence 400' long X 100' high		40,000	SF					
Anchors (2 per 10' mesh section)		81	EA			(Cont. on next page)		
(Cont. on next page)								
Data Collection Information:						Mass Bal	Borrow	CY
Team:	Hanek, Moen, Hansen	Weather:	Overcast, 45 degrees			Excess Fill	17,900	CY
Date:	15-Nov-01	Time:	12:00pm			Waste	1,882	CY

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	LM2-20		Priority Ranking	High		Locator Information/GPS		
	(Cont.)		Impact Rating	3		GPS shows 24' accuracy	Lat:	Long:
Project Development:		Lemolo 2	Risk Rating	3		Start		
Nearest Project Feature:		Waterway	Structure Type:	Steel Flume, Canal, Spillway		Reference Point	43' 20.630"	122' 17.975"
						End		
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches		
(Cont.)						Areas where ground is disturbed by construction will be protected with jute mats or other comparable erosion control measures until vegetation planting or other ground cover is provided in accordance with the VMP. Leave 6" and larger dia. trees and their roots undisturbed during sidecast removal.		
Gabion Walls 9'x400' & 3'x600'								
Excavate for tie backs		1,500	CY					
Spread compact backfill		1,100	CY					
Use as padding material (or stockpile)		400	CY					
Place wire mesh tie-backs		7,200	SF					
Place gabion baskets 9' high		400	LF					
Place gabion baskets 3' high		600	LF					
Stone fill in baskets		600	CY					
New Steel Flume								
Demolish Existing Concrete Flume		40	CY					
Demolish Existing Concrete Channel/Spillway		220	CY					
Rock Dowel		200	EA					
Concrete Pads		27	CY					
New Steel Flume		44,000	LB					
New Steel Trestle		20,000	LB					
New Access Road Bridge								
Bridge Abutments		8	CY					
Steel Bridge Deck 40' X 24'		960	SF					
Slope Revegetation								
Jute Matting (D/S Sidecast)		13,000	SF					
Revegetation (D/S Sidecast)		13,000	SF					
Jute Matting (U/S Sidecast)		3,000	SF					
Revegetation (U/S Sidecast)		3,000	SF					
Jute Matting (Streambed)		30,000	SF					
Revegetation (Streambed)		30,000	SF					
Data Collection Information:						Mass Bal	Borrow	CY
Team:	Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees			Excess Fill	17,900 CY
Date:	15-Nov-01		Time:	12:00pm			Waste	1,882 CY

LM2-20 Site Plan Potter Creek

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FERC Project No. 1927



Possible location for
30-minute waterway
drainage pipe.

New 80-ft long steel
flume on trestle for
waterway crossing of
Potter Creek

New 40-ft long bridge
for access road
crossing
See Section C

Place 3-ft high gabion basket
on upslope side of flume, fill
with existing rock from site.

Remove gunite-lined
channel, excavate fill from
former channel and
restore with boulders and
woody debris

2-Wall Concrete
Flume

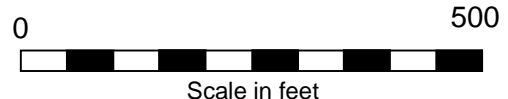
Regrade and restore
stream channel below
gunite-lined section

See Detail A

L23

Potter Creek

Concrete 2-Wall
Flume



Base map from Project
Boundary maps
Exhibit G of license
application

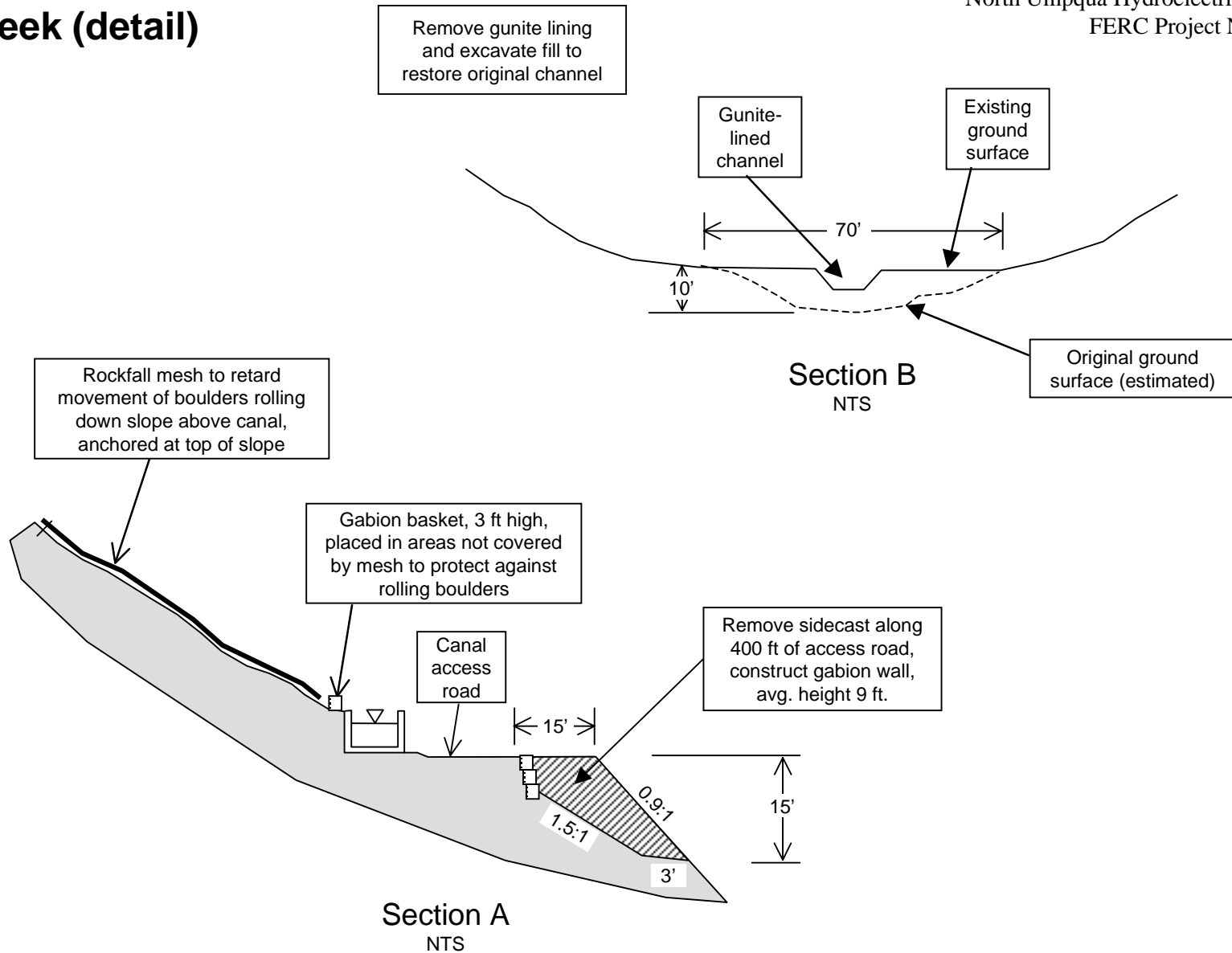
Place rock netting over 100
by 400-ft section of slope
above canal. Location to be
field verified.

Remove sidecast,
along 400-ft length,
Install gabion wall,
see Section A

North Umpqua River

LM2-20 Site Plan Potter Creek (detail)

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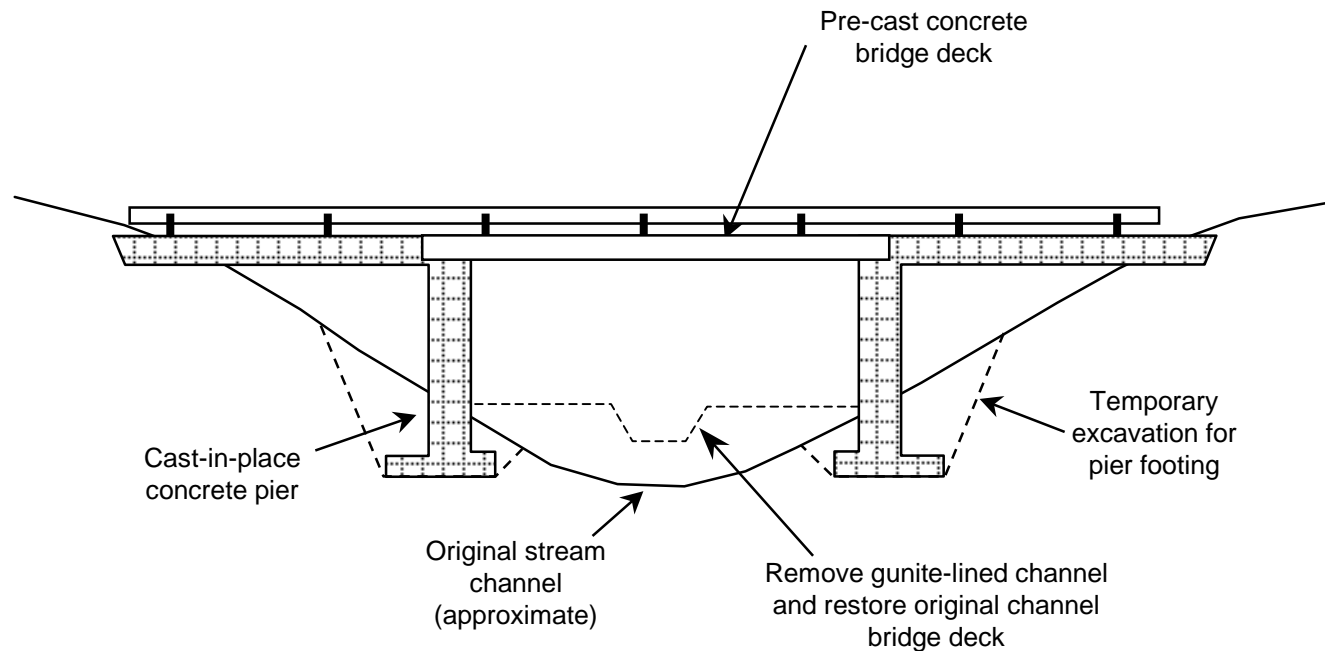
Base map from Project
Boundary maps
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LM2-20 Site Plan Potter Creek (detail)

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Section C
NTS

Cross-section showing removal of existing gunite-lined channel and access road bridge including abutment structures and precast deck

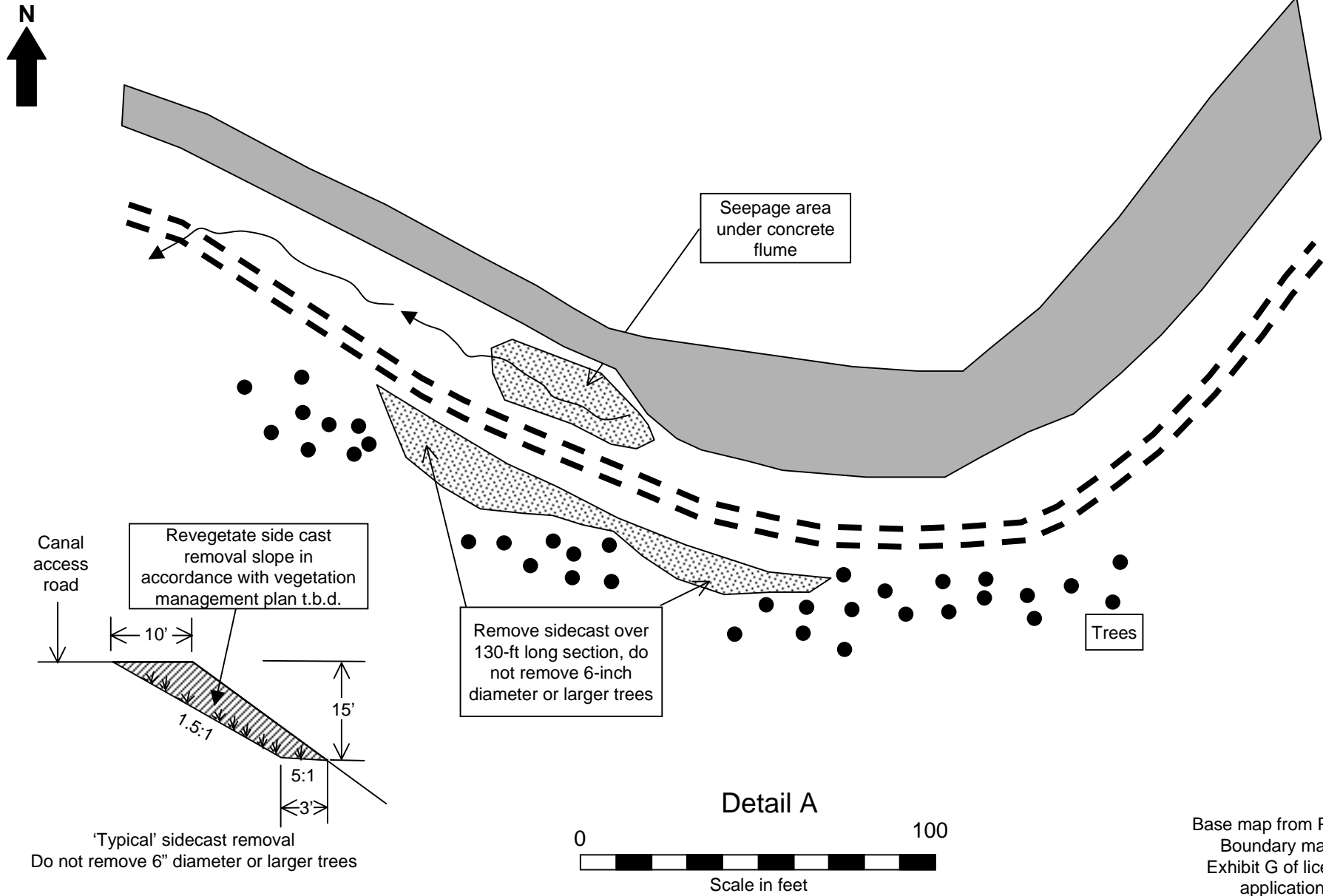
Base map from Project
Boundary maps
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LM2-20 Site Plan Potter Creek (detail)

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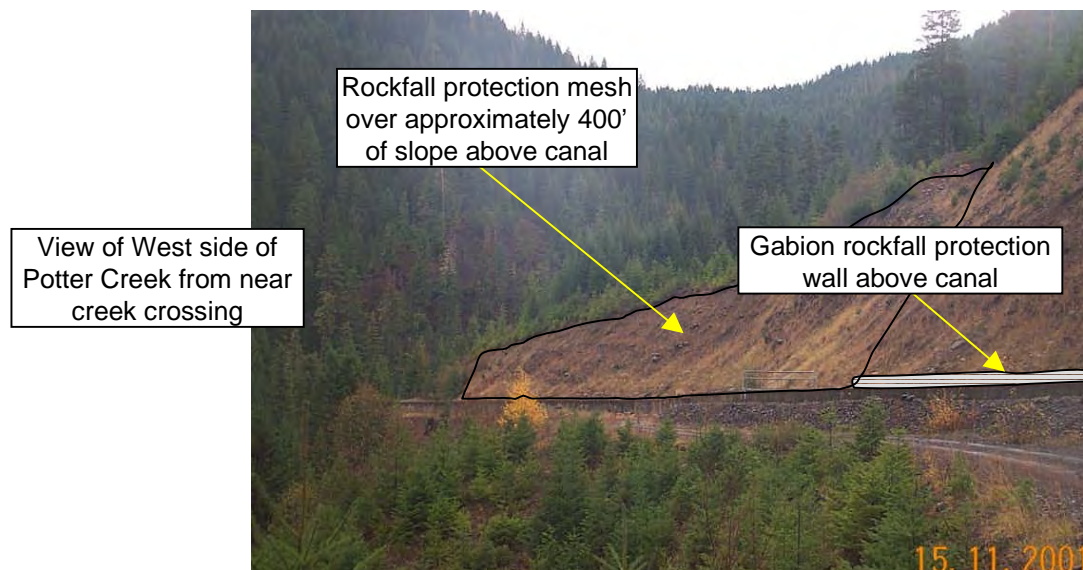
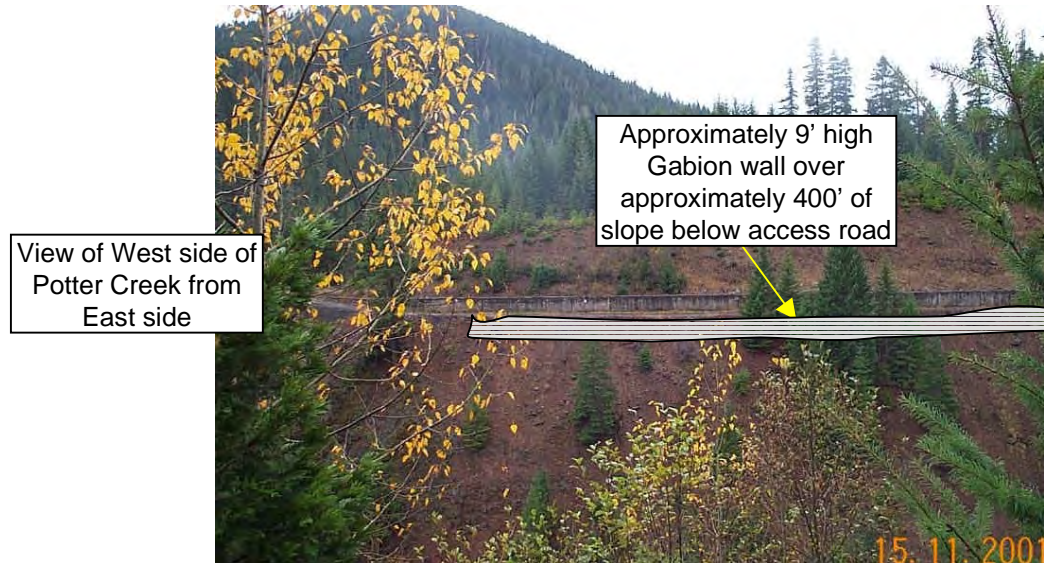


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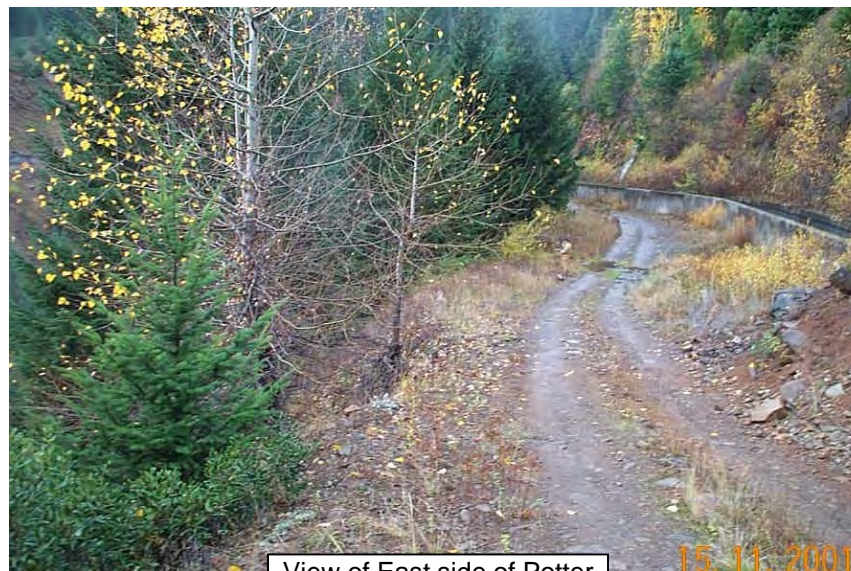
LM2-20 Site Photos Potter Creek

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LM2-20 Site Photos Potter Creek

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View of East side of Potter
Creek near seepage area
where there will be selective
sidecast removal

LM2-20 Site Photos Potter Creek

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Potter Creek gunite lined
spillway canal, to be
removed as part of stream
restoration effort



Potter Creek Inlet structure
into the canal system, to be
removed as part of stream
restoration effort



**POTTER CREEK - STREAM RESTORATION
AT LEMOLO NO.2 CANAL, SITE LM2-20**

A. General Description and Cost Considerations

1. Preparatory Work
 - 1.1 Mobilize Contractor and Construction Equipment
 - 1.2 Clear Vegetation on Flat Portions of Potter Creek, est avg 200' by 1,000'
2. Diversion during construction – Sandbag Cofferdam and Continuous Pumping
3. Demolish Existing Concrete at Potter Creek Diversion Dam Abutments – Volume = $0.5' \text{ th} \times 4' \text{ h} \times 20' \text{ l} = 40 \text{ cubic feet} = 1.5 \text{ cubic yards}$;
4. Demolish Concrete & Shotcrete Lining of Potter Creek Channel – Volume = $20' \text{ w surface} \times 600' \text{ long} \times 0.5' \text{ avg th} = 6,000 \text{ cubic feet} = 222 \text{ cubic yards}$ (Surface Area = $20' \times 600' = 12,000 \text{ SF}$)
5. Build New Steel Flume to replace portion of canal horseshoe bend
 - 5.1 Cross-section dimensions:
 - 5.1.1 Wall Height – 7.5'
 - 5.1.2 Bottom Width – 11.4'
 - 5.1.3 Wall Plate Thickness – Assume $\frac{1}{2}$ "
 - 5.1.4 Overall Length – Assume 80'
 - 5.2 Weight of Steel for Flume = $(7.5+11.4+7.5)' \text{ wide} \times 80' \text{ long} \times .042' \text{ thick} = 88.70 \text{ cubic feet} \times 490 \text{ lbs/cf} = 43,463 \text{ pounds}$
 - 5.3 Weight of steel for trestle supports – assume 20,000 pounds
6. Concrete Foundation for steel trestles
 - 6.1 Assume Concrete Pads - 3 feet high, 2 feet thick, 12 feet long (assume 10 needed)
-Concrete Volume = $5 \times 3' \times 2' \times 12' = 360 \text{ cubic feet} = 26.6 \text{ cubic yards}$
 - 6.2 Rock Doweling Required – assume 200 dowels for all 10 pads;
7. Connect Steel Flume to Concrete Canal
 - 7.1 Dewater Canal
 - 7.2 Saw Cut ends of canal to join steel flume – 2 @ $(7.5+11.4+7.5)' \times 12'' \text{ depth} = 633.6 \text{ Inch-Feet of Depth}$
 - 7.3 Demolish cut portion of concrete canal – $(7.5+11.4+7.5)' \times 40' \times 1' = 1,056 \text{ cubic feet} = 39 \text{ cubic yards}$ – use rubble as riprap
 - 7.4 Place Steel Flume on Trestle and grout connection with concrete canal
 - 7.5 Resume operation of Lemolo No. 2 canal
8. Excavate Potter Creek channel to original or uniform grade slope
 - 8.1 Assume average trapezoidal cross-section for 600' length
 - 8.1.1 Top width = 75'
 - 8.1.2 Bottom width = 12'
 - 8.1.3 Average Height = 15'
 - 8.2 Volume of Excavation = $\frac{1}{2} \times (75+12)' \times 15' \times 600' = 391,500 \text{ cubic feet} = 14,500 \text{ cubic yards}$
9. Streambed restoration, 15' wide stream bed improved over 1500' of length 22,500 sf of restored area to include large woody debris and stream bed gravels

10. Replace Existing Road Bridge with longer span bridge
 - 10.1 Assume Length of bridge = 40'
 - 10.2 Assume minimal concrete abutments, say 4 cubic yards each
11. Gabion Wall, 3' high by 600' long = 1,800 sf
 - 11.1 Build Gabions
 - 11.2 Place Fill on Upslope side of gabions
12. D/S Slope Protection
 - 12.1 Wire Mesh slope protection, 400' x 100' = 40,000 sf of mesh
 - 12.2 Anchors for wire mesh panels assume 10' sections, with 2 anchor per section total of 81 anchors
- 13 Sidecast fill removal and revetment
 - 13.1 D/S section 15' along top, 15' deep with a 3' bench assume total area of cut ($\frac{1}{2} \times (15' + 24') \times 9' + (\frac{1}{2} \times (24' + 3')) \times 3' \times 400' = 86,400 \text{ CF} = 3,200 \text{ CY}$)
 - 13.2 U/S section ($\frac{1}{2} \times (15' + 3') \times 15' \times 130' = 17,550 \text{ SF} = 650 \text{ CY}$)
 - 13.3 Gabion wall 9' high by 400' long = 3,600 SF
- 14 Re-vegetate Exposed Slopes
 - 14.1 D/S Sidecast Surface Area = 32' x 400' = 12,800 SF
 - 14.2 U/S Sidecast Surface Area = 24' x 130' = 3,120 SF
 - 14.3 Creek Restoration Surface Area = 60' x 500' = 30,000 SF
- 15 Additional Cost Input
 - 15.1 Contractor Demobilization
 - 15.2 Owner's Engineering and Design
 - 15.3 Owner's Construction Inspection
 - 15.4 Owner's Permitting
 - 15.5 Contingency Allowance

B. Estimated Construction Schedule

Based on the estimated quantities and selected equipment spreads to perform the work shown in the construction cost estimate, the scope of construction work identified above could be completed in a period of 50 workdays, plus contract negotiations, mobilization, demobilization, and end of project punchlist work. A reasonable total duration time to successfully perform this construction work is about 12 weeks during the summer or fall months. This amount of time is for construction fieldwork, and does not include shop time for steel fabrication.

North Umpqua Hydroelectric Project (FERC 1927)

Erosion Control Plan

Site Remediation/ Assessment Form

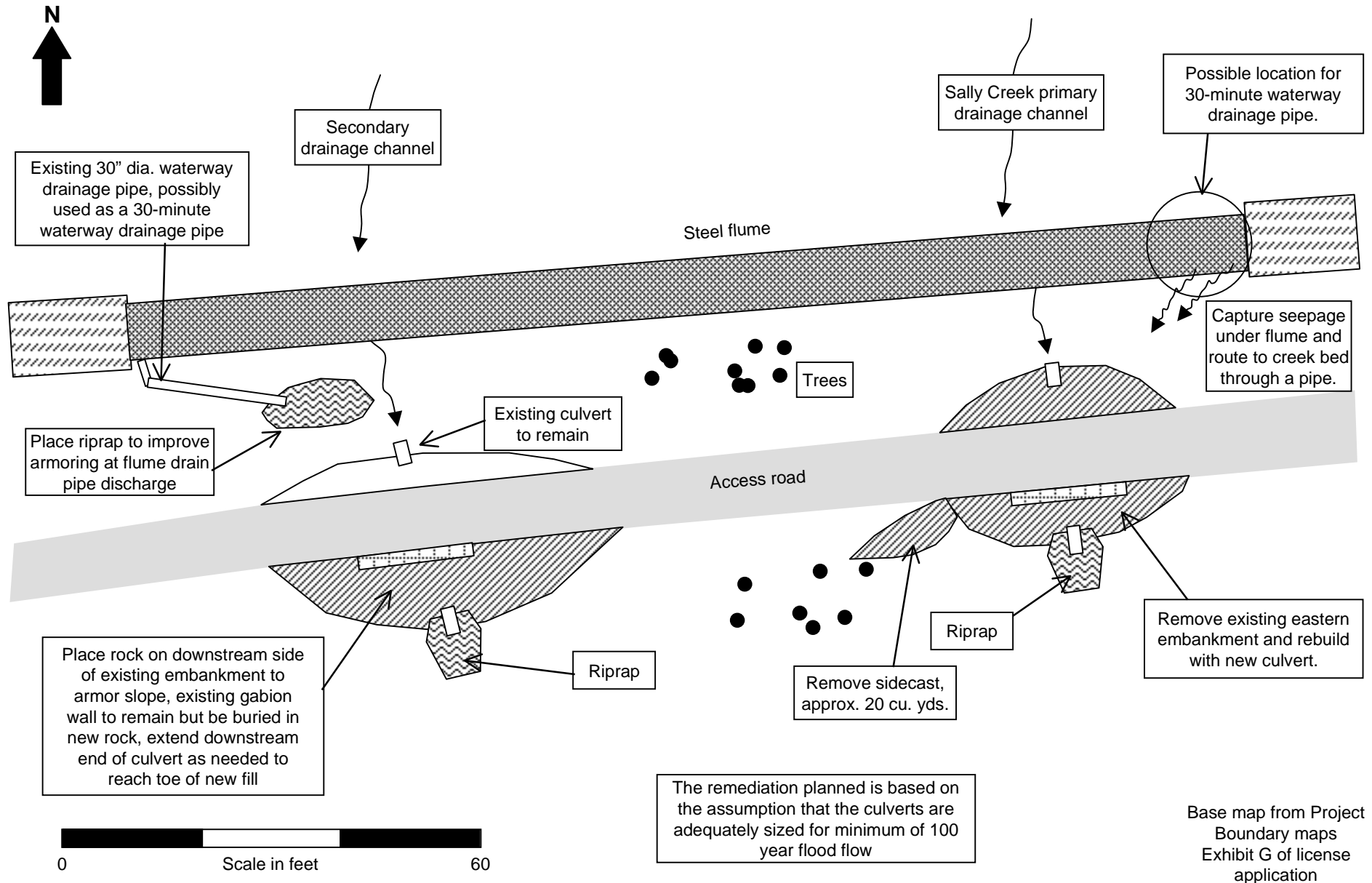
Site #	LM2-21		Priority Ranking	High		Locator Information/GPS		
			Impact Rating	3		GPS shows 33' accuracy	Lat:	Long:
Project Development:		Lemolo 2	Risk Rating	2		Start		
Nearest Project Feature:		Waterway	Structure Type:	Canal, Access Road, Culvert		Reference Point	43' 20.886"	122' 17.463"
Description of Concern: Two embankments, each with a culvert. On western embankment, downstream fill is oversteepened. Small gabion wall previously installed across top of fill to maintain road. Drainage pipe from flume drops water into small splash pool upstream of culvert. Culvert under eastern embankment is approx. half full of sediment. Gabion wall also constructed on east embankment. Sidecast fill present in areas between embankments. Seepage under flume.								
Proposed Remediation: Western embankment - place rock on downstream side to armor slope, provide buttressing, and bring up so that culvert does not shotgun. Improve armoring at drain pipe discharge. Eastern embankment - remove and rebuild with new culvert. Capture seepage below flume and bring down to creek bed in a pipe instead of letting it run down slope beneath flume. Remove sidecast as shown on sketch.								
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches		
Culvert Crossing						Proposed location for 30-minute waterway drainage pipe. Additional engineering investigations and designs to be completed for drainage pipes. Feasibility of using existing 30-inch diameter waterway drain pipe as part of the 30-minute drainage system may be examined. Design process will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments.		
Excavation of existing crossing		240	CY					
Waste disposal		20	CY					
Fill from stockpile		300	CY					
Fill material imported from other sites		62	CY					
Roadbed material 1" minus pitrun		6	CY					
New 60" culvert (field judgement)		55	FT					
Rock buttress of culvert slope		60	CY					
Pipe Bedding		20	CY					
Riprap 1.5'-3' rock		30	CY					
Sidecast Removal						Methods for placement of riprap on downstream face of western embankment to be determined during final design, but may include benching and layer placement, end dumping, clamshell or other methods.		
Excavation		20	CY					
Use as padding material (or stockpile)		18	CY					
Waste disposal		2	CY			Areas where ground is disturbed by construction will be protected with jute mats or other comparable erosion control measures until vegetation planting or other ground cover is provided in accordance with the VMP.		
Captured Seepage Reroute Pipe								
24" CMP		50	FT					
Concrete Anchor block		1	CY					
(Cont. on next page)								
Data Collection Information:						Mass Bal	Borrow	62 CY
Team:	Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees			Excess Fill	CY
Date:	15-Nov-01		Time:	2:00pm			Waste	22 CY

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

[illegible]

LM2-21 Site Plan Sally Creek

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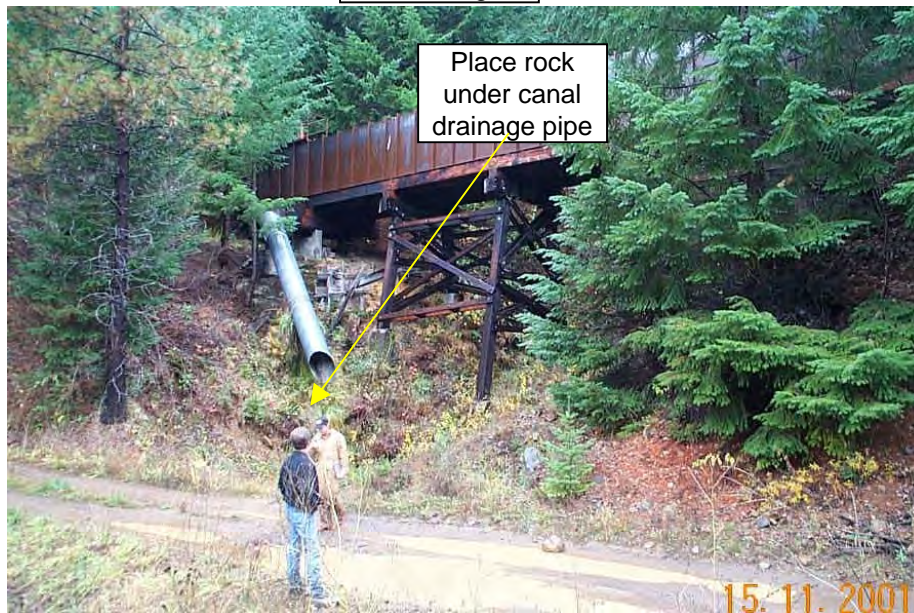
03/11/2004

Revised: 6/28/2002

LM2-21 Site Photos Sally Creek

PacifiCorp
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FERC Project No. 1927

View of West
creek flume
crossing



View of East
creek flume
crossing



LM2-21 Site Photo Sally Creek

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Seepage observed at eastern
(upstream) transition from steel
flume to concrete canal. Water to
be captured in a pipe and brought
down to the creek bed

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/Assessment Form

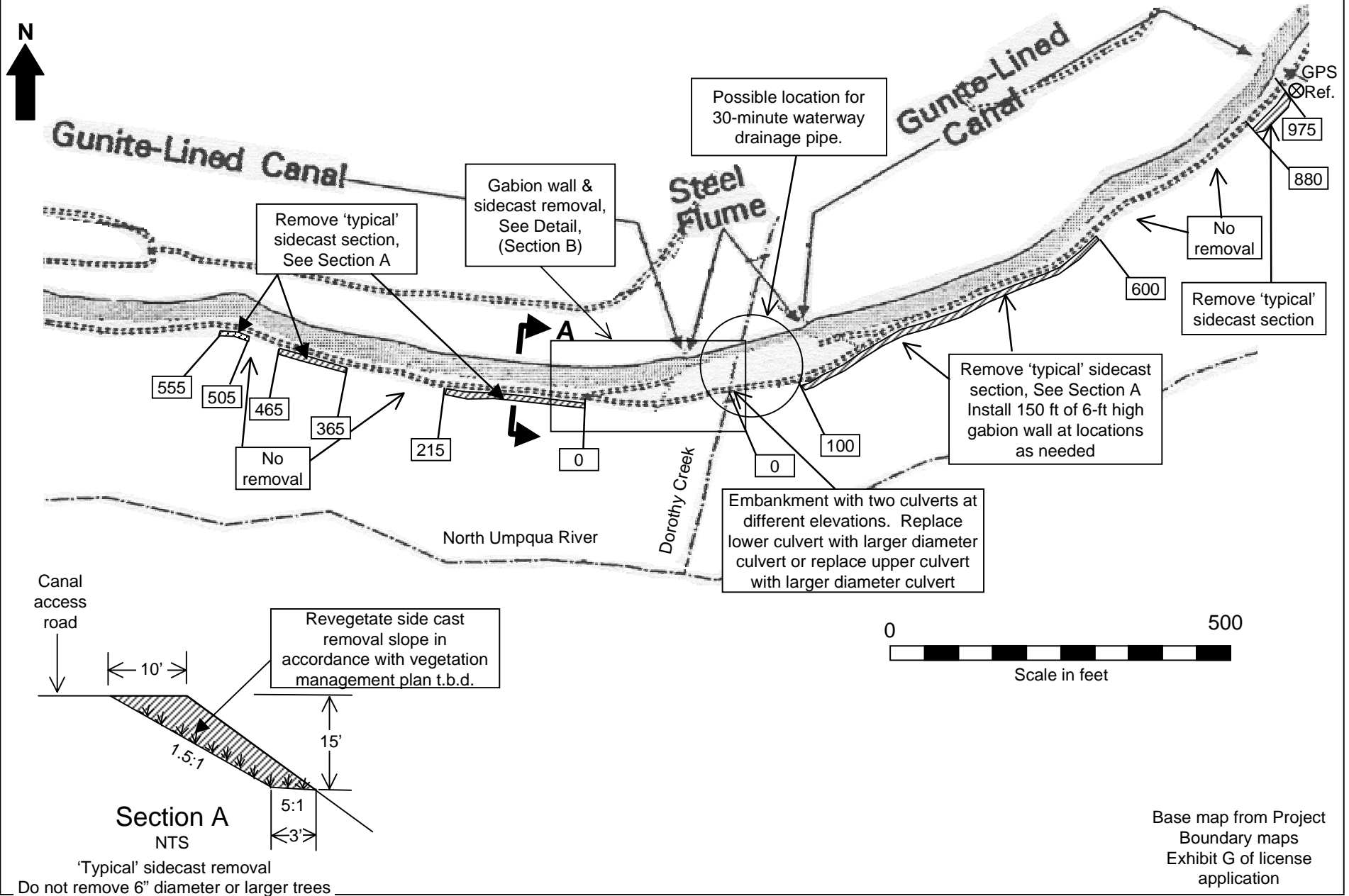
Site #	LM2-22		Priority Ranking	High	High		Locator Information/GPS																																																																																																																														
			Impact Rating	3	3			Lat:	Long:																																																																																																																												
Project Development:		Lemolo 2	Risk Rating	2	2		Start																																																																																																																														
Nearest Project Feature:		Waterway	Structure Type:	Access Road & Culvert			Reference Point	43' 20.984"	122' 17.102"																																																																																																																												
							End	43' 20.948"	122' 17.252"																																																																																																																												
Description of Concern: Embankment with two culverts through it. Lower culvert in stream channel has partially blocked inlet - boulders have moved in front of it. Appears undersized for volume of flow. Area around inlet is armored with boulders and near vertical. Upper culvert is clean and dry. Oversteepened sidecast fill in areas east and west of creek crossing, many areas raveling and potential failure.																																																																																																																																					
Proposed Remediation: Remove upper and lower culverts and replace lower culvert with larger culvert. (Alternative - replace upper culvert with larger diameter). Selectively remove sidecast fill both east and west of creek crossing. See sketch.																																																																																																																																					
<table border="1"> <thead> <tr> <th>Remediation Task Breakdown:</th> <th>Approx. quantity</th> <th>units</th> <th>unit price</th> <th>Estimated Costs (2001\$)</th> <th>Additional Comments/Sketches</th> </tr> </thead> <tbody> <tr> <td>Culvert Crossing</td> <td></td> <td></td> <td></td> <td></td> <td rowspan="14"> Site is at Dorothy Creek. New culvert to be sized for Q100 flow. Proposed location for 30-minute waterway drainage pipe. Additional engineering investigations and designs to be completed for drainage pipes. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may include additional erosion control measures. Sidecast to be removed selectively, leaving trees of 6-inch diameter and larger in place, and not disturbing their roots. Areas where ground is disturbed by construction will be protected with jute mats or other comparable erosion control measures until vegetation planting or other ground cover is provided in accordance with the VMP. </td> </tr> <tr> <td>Excavation of existing crossing</td> <td>1,600</td> <td>CY</td> <td></td> <td></td> </tr> <tr> <td>Waste disposal</td> <td>100</td> <td>CY</td> <td></td> <td></td> </tr> <tr> <td>Fill from stockpile</td> <td>2,000</td> <td>CY</td> <td></td> <td></td> </tr> <tr> <td>Borrow fill from stockpile</td> <td>500</td> <td>CY</td> <td></td> <td></td> </tr> <tr> <td>Roadbed material 1" minus pitrun</td> <td>12</td> <td>CY</td> <td></td> <td></td> </tr> <tr> <td>New 72" culvert</td> <td>98</td> <td>FT</td> <td></td> <td></td> </tr> <tr> <td>Pipe Bedding</td> <td>30</td> <td>CY</td> <td></td> <td></td> </tr> <tr> <td>Riprap 1.5'-3' rock</td> <td>15</td> <td>CY</td> <td></td> <td></td> </tr> <tr> <td>Sidecast Removal</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Excavation</td> <td>3,800</td> <td>CY</td> <td></td> <td></td> </tr> <tr> <td>Use as padding material (or stockpile)</td> <td>3,500</td> <td>CY</td> <td></td> <td></td> </tr> <tr> <td>Waste disposal</td> <td>300</td> <td>CY</td> <td></td> <td></td> </tr> <tr> <td>Gabion Wall 6' X 150'</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Excavate for tie backs</td> <td>270</td> <td>CY</td> <td></td> <td></td> </tr> <tr> <td>Spread compact backfill</td> <td>200</td> <td>CY</td> <td></td> <td></td> </tr> <tr> <td>Use as padding material (or stockpile)</td> <td>70</td> <td>CY</td> <td></td> <td></td> </tr> <tr> <td colspan="5">(Cont. on next page)</td> </tr> <tr> <td colspan="2">Data Collection Information:</td> <td colspan="3"></td> <td>Mass Bal</td> <td>Borrow</td> <td></td> <td>CY</td> </tr> <tr> <td>Team:</td> <td colspan="2">Hanek, Moen, Hansen</td> <td>Weather:</td> <td colspan="2">Overcast, 45 degrees</td> <td>Excess Fill</td> <td>3,070</td> <td>CY</td> </tr> <tr> <td>Date:</td> <td colspan="2">15-Nov-01</td> <td>Time:</td> <td colspan="2">2:30pm</td> <td>Waste</td> <td>400</td> <td>CY</td> </tr> </tbody> </table>										Remediation Task Breakdown:	Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches	Culvert Crossing					Site is at Dorothy Creek. New culvert to be sized for Q100 flow. Proposed location for 30-minute waterway drainage pipe. Additional engineering investigations and designs to be completed for drainage pipes. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may include additional erosion control measures. Sidecast to be removed selectively, leaving trees of 6-inch diameter and larger in place, and not disturbing their roots. Areas where ground is disturbed by construction will be protected with jute mats or other comparable erosion control measures until vegetation planting or other ground cover is provided in accordance with the VMP.	Excavation of existing crossing	1,600	CY			Waste disposal	100	CY			Fill from stockpile	2,000	CY			Borrow fill from stockpile	500	CY			Roadbed material 1" minus pitrun	12	CY			New 72" culvert	98	FT			Pipe Bedding	30	CY			Riprap 1.5'-3' rock	15	CY			Sidecast Removal					Excavation	3,800	CY			Use as padding material (or stockpile)	3,500	CY			Waste disposal	300	CY			Gabion Wall 6' X 150'					Excavate for tie backs	270	CY			Spread compact backfill	200	CY			Use as padding material (or stockpile)	70	CY			(Cont. on next page)					Data Collection Information:					Mass Bal	Borrow		CY	Team:	Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees		Excess Fill	3,070	CY	Date:	15-Nov-01		Time:	2:30pm		Waste	400	CY
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Site Remediation/Assessment Form

Revised: 3/4/2004

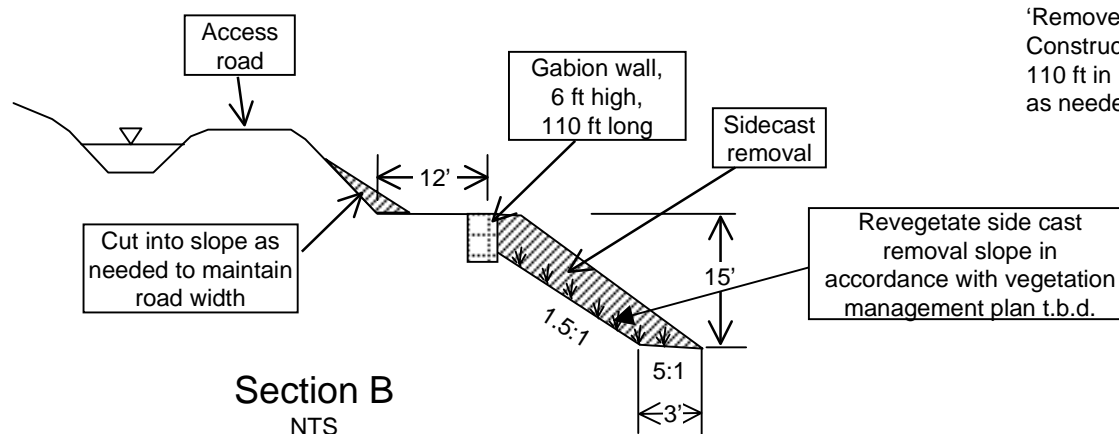
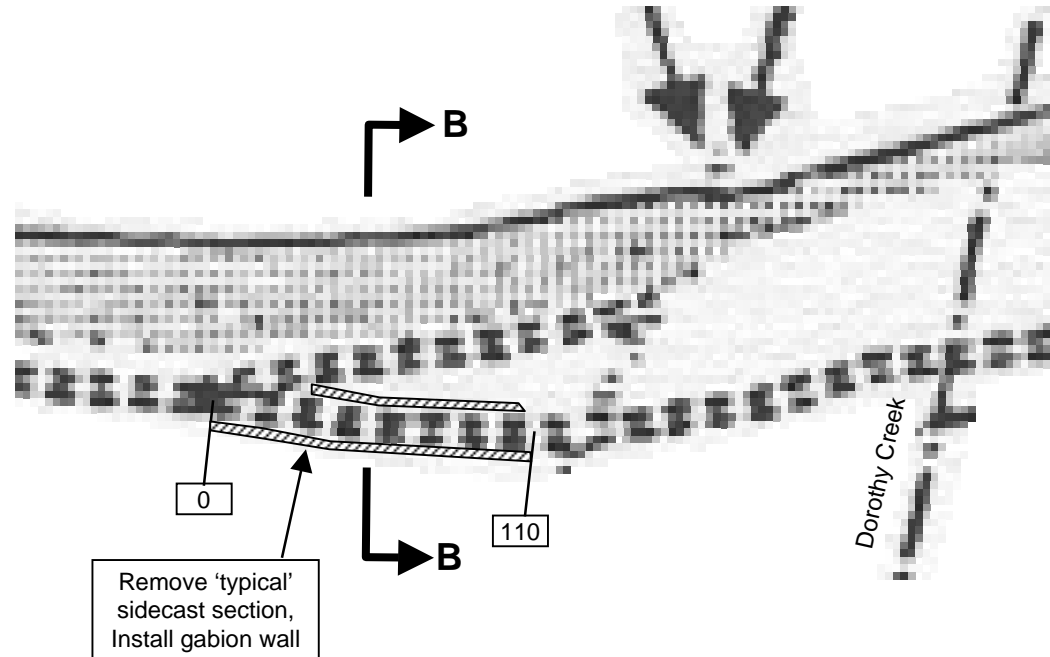
LM2-22 Site Plan Dorothy Creek

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LM2-22 Site Plan Dorothy Creek (detail)

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'Remove sidecast below access road
Construct gabion wall along outboard edge of road,
110 ft in length, 6 ft high. Cut into slope above road
as needed to maintain 12 ft road width

Base map from Project
Boundary maps
Exhibit G of license
application

LM2-22 Site Photo Dorothy Creek

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



North Umpqua Hydroelectric Project (FERC 1927)

Erosion Control Plan

Site Remediation/ Assessment Form

Site #	LM2-23		Priority Ranking	High		Locator Information/GPS			
			Impact Rating	3		Start	Lat:	Long:	
Project Development:		Lemolo 2	Risk Rating	3		Reference Point	43' 20.984"	122' 17.102"	
Nearest Project Feature:		Waterway	Structure Type:		Canal, Concrete Flume, Access Road	End			
Description of Concern: Site starts east of Dorothy Creek, at transition from gunite lined canal to concrete flume. Oversteepened and potentially unstable sidecast below access road. Several areas of high cuts above canal, with many boulders showing in cut. Boulders fall into canal frequently, as shown by extensive spoil piles along canal.									
Proposed Remediation: Selectively remove sidecast in areas shown on sketch map. Leave larger trees in place. Install mesh over upslope cut to prevent rocks from bouncing into outboard wall of canal. Install mesh over a 300-ft long section of canal where the cut is highest. Height varies from approx. 60 to 90 ft.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
Sidecast Removal						Aquatic connectivity sites L16, L17, L18, and L20 lie within the area of this site. Issues related to future modifications planned to restore aquatic connectivity at this site have not been taken into account in evaluating erosion mitigation measures at this site. Final design of aquatic connectivity measures at this site may result in modifications to the dimensions and limits of the proposed treatments			
Excavation		2,500	CY						
Use as padding material (or stockpile)		2,300	CY						
Waste disposal		200	CY						
Rockfall Fence									
Rockfall Fence 300' long X 80' high		24,000	SF			Prior to construction of erosion mitigation measures, agency personnel will review draft designs as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments.			
Anchors (2 per 10' mesh section)		61	EA						
Slope Revegetation									
Jute Matting		21,000	SF						
Revegetation		21,000	SF						
						In areas of sidecast removal, leave 6" and larger dia. trees and their roots undisturbed. Areas where ground is disturbed will be protected with jute mats or other comparable erosion control measures until vegetation planting or other ground cover is provided in accordance with the VMP.			
Data Collection Information:						Mass Bal	Borrow		CY
Team:	Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees			Excess Fill	2,300	CY
Date:	15-Nov-01		Time:	3:30pm			Waste	200	CY

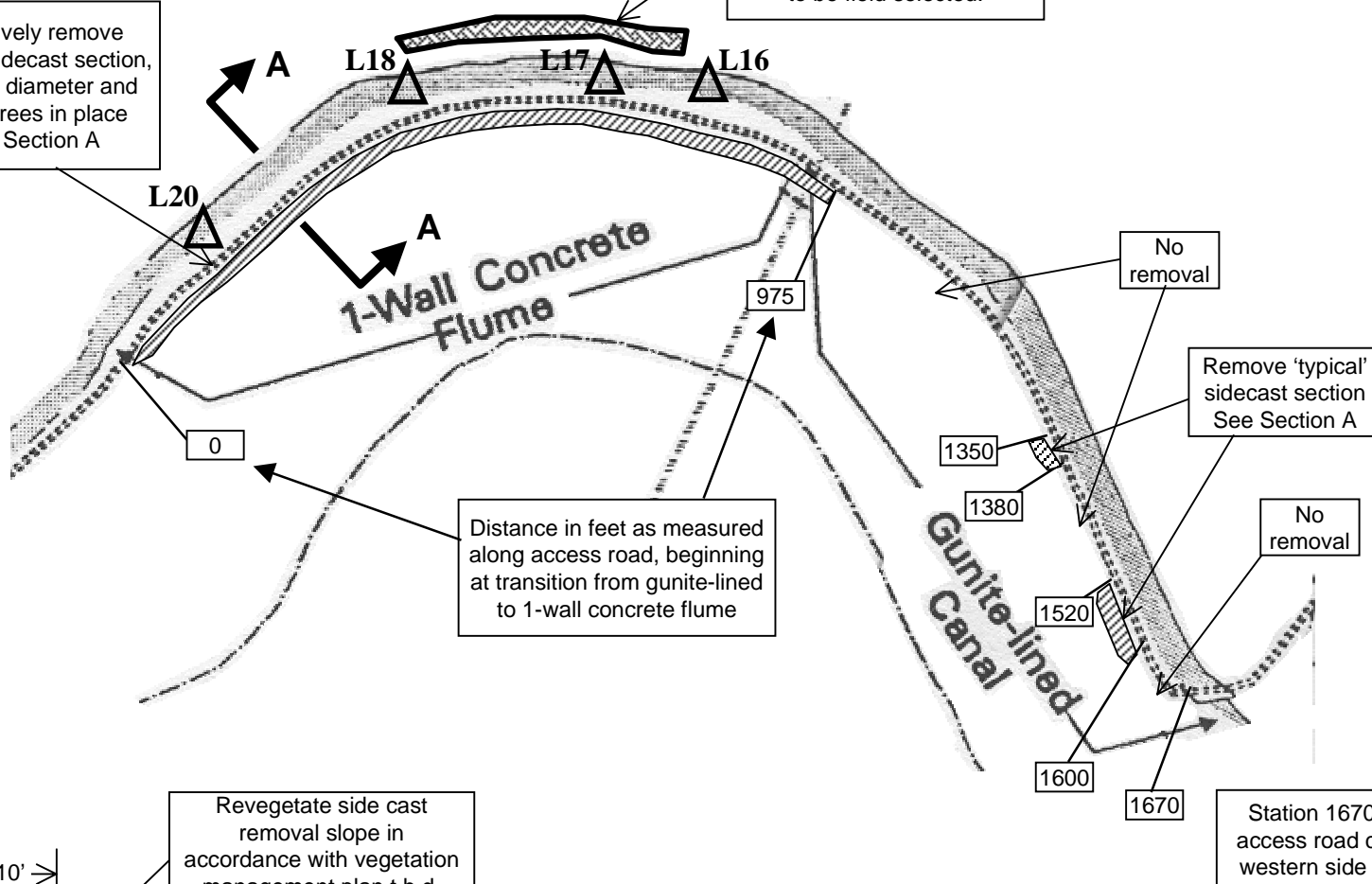
LM2-23 Site Plan

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



Selectively remove
'typical' sidecast section,
leave 6" diameter and
larger trees in place
See Section A

Place 60 to 90 ft high rock
netting along 300-ft reach of
slope above canal. Location
to be field selected.



Canal
access
road

Section A NTS

Revegetate side cast
removal slope in
accordance with vegetation
management plan t.b.d.

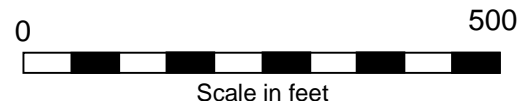
1.5:1

15'

5:1

3'

'Typical' sidecast removal
Do not remove 6" diameter or larger trees



Base map from Project
Boundary maps
Exhibit G of license
application

03/11/2004

Revised: 6/28/2002

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

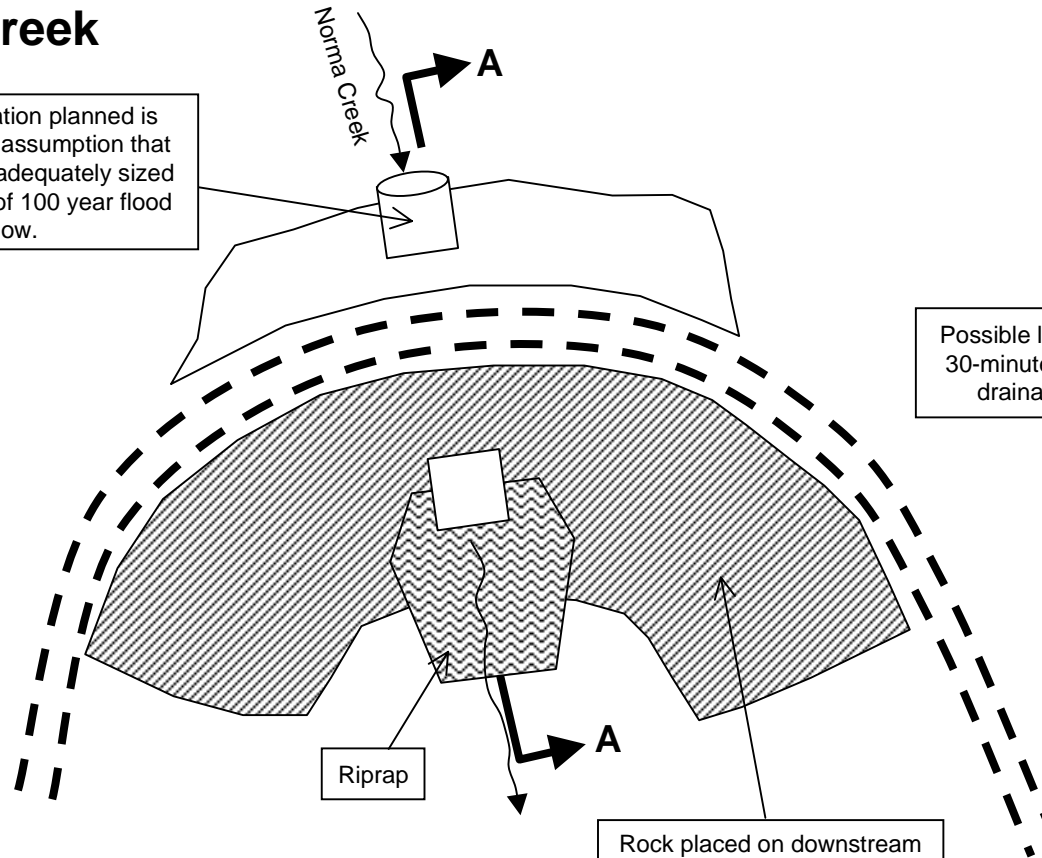
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			Impact Rating	3		GPS shows 180 ft accuracy	Lat:	Long:	
			Risk Rating	1		Start			
Project Development:		Lemolo 2	Structure Type:		Canal, Concrete Flume, Access Road	Reference Point	43' 21.166"	122' 16.669"	
Nearest Project Feature:		Waterway				End			
Description of Concern: Access road crosses Norma Creek on a small embankment. Downstream side is oversteepened and culvert is shotgunned. Culvert inlet is clear and culvert is in good shape.									
Proposed Remediation: Armor downstream side of embankment with rock, bring up to elevation of culvert outlet. Continue rock up downstream side of embankment to elevation of road, as shown on sketch.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
						Site is at Norma Creek. Culvert to be replaced if inadequate for Q ₀₀ flow. Proposed location for 30-minute waterway drainage pipe. Additional engineering investigations and designs to be completed for drainage pipes. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may include additional erosion control measures. Method for placement of riprap on downstream face of embankment to be determined during final design, but may include benching and layer placement, end dumping, clamshell or other methods.			
Buttress Fill									
Clear slope		1000	SF						
Waste Disposal		5	CY						
Pitrun rockfill 10" minus		90	CY						
Riprap 1.5'-3' rock		12	CY						
Data Collection Information:						Mass Bal	Borrow		CY
Team:	Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees			Excess Fill		CY
Date:	15-Nov-01		Time:	4:30pm			Waste	5	CY

LM2-24 Site Plan Norma Creek

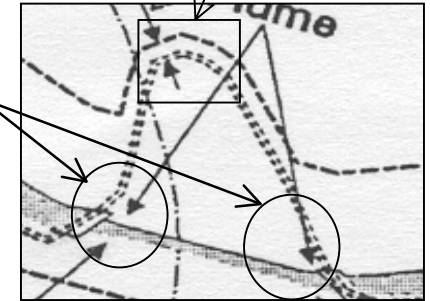
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FERC Project No. 1927



The remediation planned is based on the assumption that the culvert is adequately sized for minimum of 100 year flood flow.



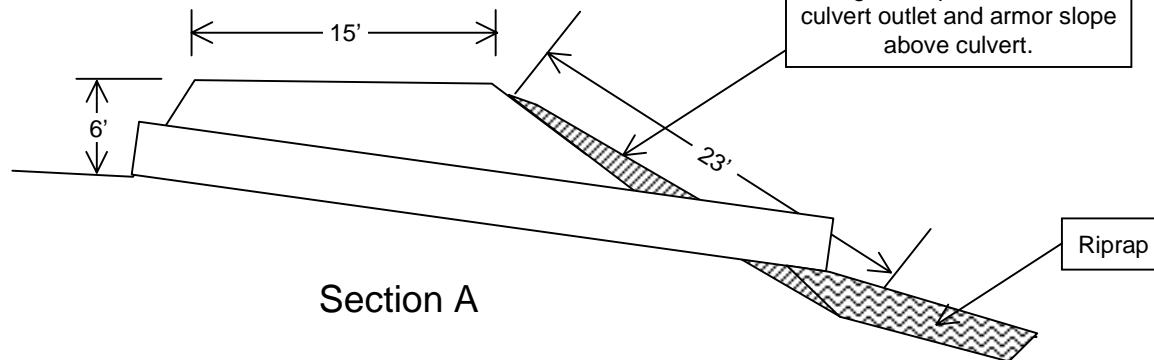
Possible locations for 30-minute waterway drainage pipe.



Location Map
NTS

Rock placed on downstream face of existing embankment to create 1.5:1 slope. Bring rock up to elevation of culvert outlet and armor slope above culvert.

0 Scale in feet 30



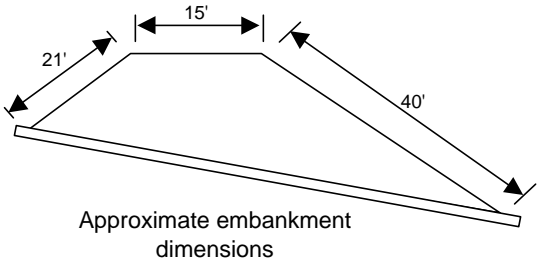
Section A

Base map from Project
Boundary maps
Exhibit G of license
application

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	LM2-25		Priority Ranking	Med (3)		Locator Information/GPS		
			Impact Rating	5		GPS shows 16 ft accuracy	Lat:	Long:
Project Development:		Lemolo 2	Risk Rating	1		Start		
Nearest Project Feature:		Waterway	Structure Type:	Canal, Access Road		Reference Point	43' 21.226"	122' 16.203"
Description of Concern: Slope 20 to 30 ft high above canal, includes isolated boulders that could roll into canal and cause damage. Site includes Helen Creek crossing.								
Proposed Remediation: Mitigate damage potential through installation of drainage pipes at selected locations along waterway so that canal can be drained in 30 minutes. Monitor slope for signs of failure and implement additional mitigation measures if required. Replace culvert under access road embankment only if culvert analysis indicates that it is undersized.								
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches		
NA						Helen Creek crossing. Aquatic connectivity site L15 lies within the area of this site. Issues related to future modifications planned to restore aquatic connectivity have not been taken into account in evaluating erosion mitigation measures. Final design of aquatic connectivity measures at this site may result in modifications to the dimensions and limits of the proposed treatments		
						Proposed location for 30-minute waterway drainage pipe. Additional engineering investigations and designs to be completed for drainage pipes. Design process will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may include additional erosion control measures.		
						(Cont. on next page)		
Data Collection Information:						Mass Bal	Borrow	CY
Team:	Hanek, Moen, Hansen	Weather:	Overcast, 45 degrees				Excess Fill	CY
Date:	16-Nov-01	Time:	9:00am				Waste	CY

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	LM2-25 (Cont.)		Priority Ranking	Med		Locator Information/GPS		
			Impact Rating	3		GPS shows 16 ft accuracy		
			Risk Rating	1		Start	Lat:	Long:
Project Development:		Lemolo 2				Reference Point	43' 21.226"	122' 16.203"
Nearest Project Feature:		Waterway	Structure Type:		Canal, Access Road	End		
Remediation Task Breakdown:								
		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches		
						 <p>Approximate embankment dimensions</p>		
Data Collection Information:								
Team:	Hanek, Moen, Hansen	Weather:	Overcast, 45 degrees				Excess Fill	CY
Date:	16-Nov-01	Time:	9:00am				Waste	CY

LM2-25 Site Photos Helen Creek

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927

Medium priority site
No remediation planned other
than mitigation through
installation of 30-minute
drainage pipes

Monitor slopes above canal to
observe erosion pattern and evaluate
if there is need for additional
measures in the future



North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

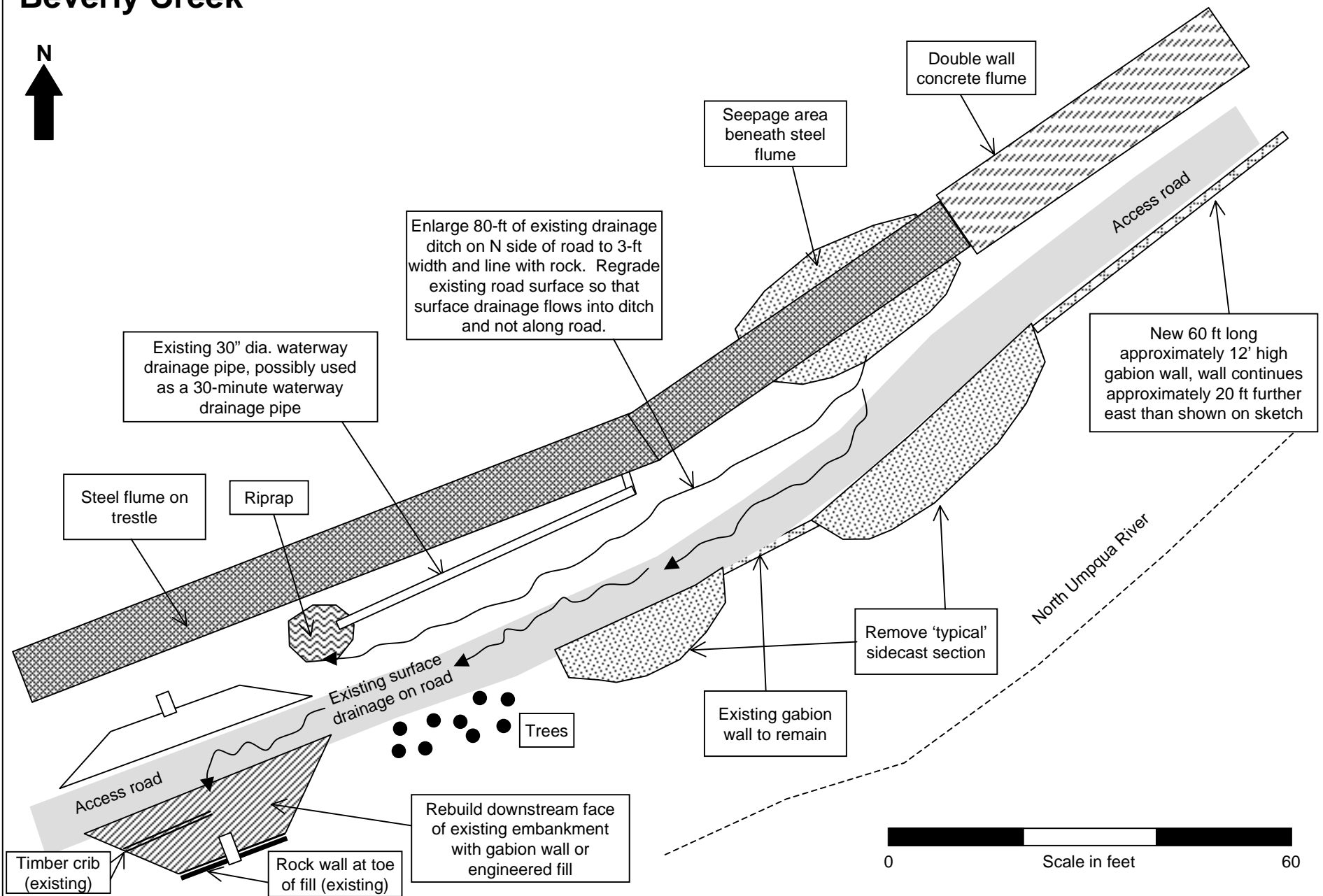
Site #	LM2-26		Priority Ranking	High		Locator Information/GPS			
			Impact Rating	3		GPS shows 22 ft accuracy	Lat:	Long:	
Project Development:		Lemolo 2	Risk Rating	2		Start			
Nearest Project Feature:		Waterway	Structure Type:	Access Road		Reference Point	43' 21.286"	122' 16.021"	
						End			
Description of Concern: Access road embankment has oversteepened D/S side, drainage from road surface onto D/S face. Drainage down access road from east approach, also seepage in ditch on north side of road with potential to reach road surface and cause additional erosion. Areas of oversteepened sidecast to east of stream crossing, with little or no vegetation present.									
Proposed Remediation: Rebuild downstream side of embankment fill with gabion wall or engineered fill. Regrade road surface, excavate ditch on north side of road and line with rock to prevent downcutting. Remove sidecast fill from areas east of stream crossing and construct 60-ft long gabion wall, 12-ft high to maintain road surface and prevent further erosion of access road. See sketch.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
Sidecast Removal						Beverly Creek crossing. This site is also a proposed location for 30-minute waterway drainage pipe. Design process may evaluate feasibility of using existing 30-inch diameter waterway drain pipe for 30-minute drainage. Additional engineering investigations and designs to be completed for drainage pipes. Design process will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments Areas where ground is disturbed by construction will be protected with jute mats or other comparable erosion control measures until vegetation planting or other ground cover is provided in accordance with the VMP.			
Excavation		290	CY						
Use as padding material (or stockpile)		260	CY						
Waste disposal		30	SF						
Gabion Walls 9'x40' & 12'x60'									
Excavate for tie backs		390	CY						
Spread compact backfill		340	CY						
Use as padding material (or stockpile)		50	CY						
Place wire mesh tie-backs		2,500	SF						
Place gabion baskets 9' high		40	LF						
Place gabion baskets 12' high		60	LF						
Stone fill in baskets		120	CY						
Regrade Road & Establish Ditch on 80'									
Grader		4	HR						
Small excavator		4	HR						
Rock Uner 30" Drainage Pipe									
Riprap 1.5'-3' rock		5	CY						
(Cont. on next page)									
Data Collection Information:						Mass Bal	Borrow		CY
Team:	Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees			Excess Fill	310	CY
Date:	16-Nov-01		Time:	10:00am			Waste	30	CY

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	LM2-26 (Cont.)		Priority Ranking	High (4)		Locator Information/GPS				
			Impact Rating	5		GPS shows 22 ft accuracy		Lat:	Long:	
			Risk Rating	3		Start				
Project Development:		Lemolo 2				Reference Point		43' 21.286"	122' 16.021"	
Nearest Project Feature:		Waterway	Structure Type:			Access Road		End		
Remediation Task Breakdown:			Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
(Cont.)										
Slope Revegetation										
Jute Matting			2,400	SF						
Revegetation			2,400	SF						
Data Collection Information:										Mass Bal
Team:	Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees				Excess Fill	310	CY
Date:	16-Nov-01		Time:	10:00am				Waste	30	CY

LM2-26 Site Plan Beverly Creek

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



03/11/2004

Revised: 6/28/2002

LM2-26 Site Photos Beverly Creek

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



Looking East at
Beverly Creek
Crossing



Looking West
upstream of Beverly
Creek Crossing

Existing Gabion
Wall

Areas for 'typical' side cast
removal on either side of
existing Gabion wall



Looking West at
Beverly Creek
Crossing

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

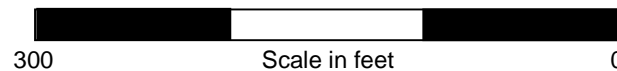
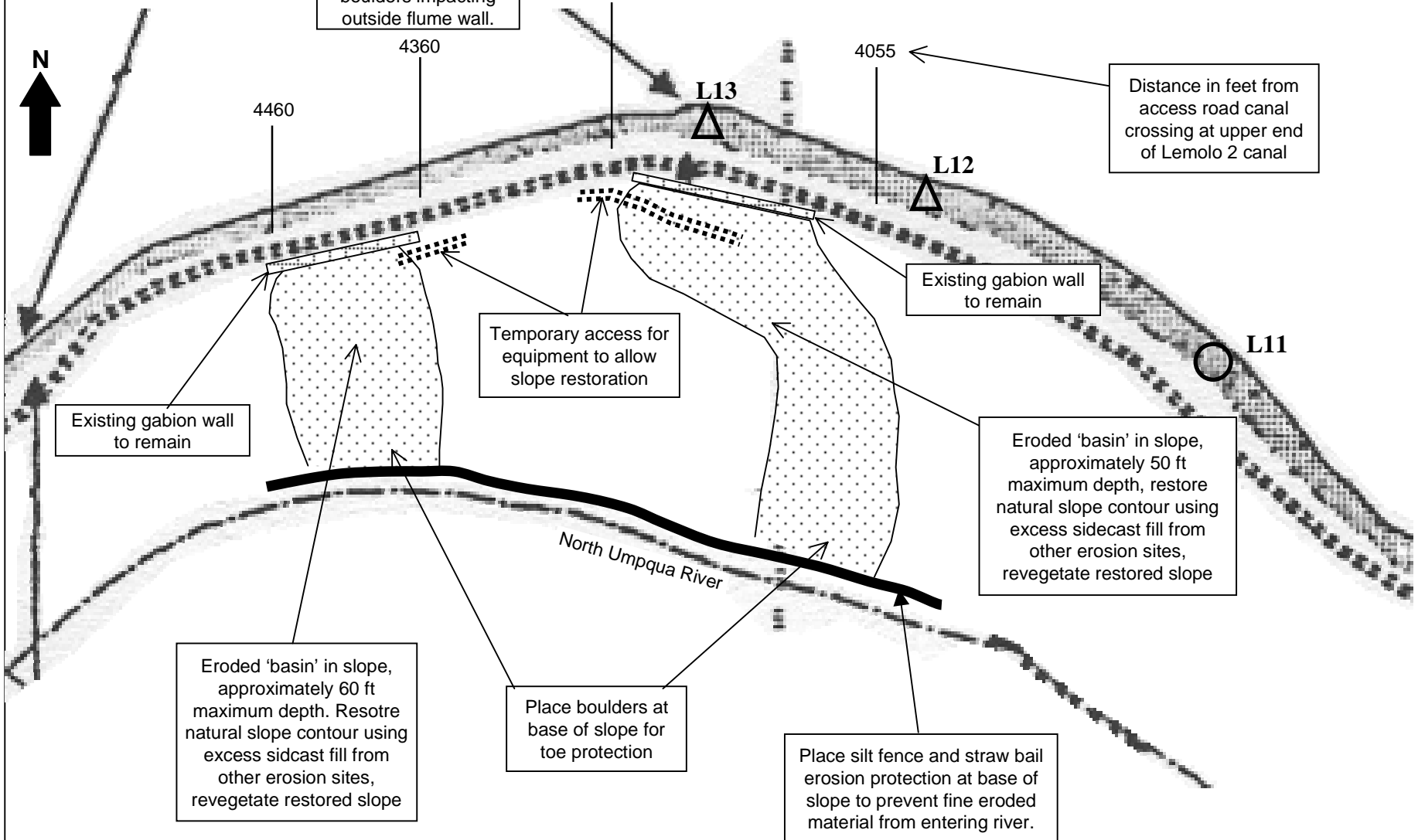
Site #	LM2-27		Priority Ranking	High	High		Locator Information/GPS			
			Impact Rating	3	3		GPS acc. 38' (S) and 138' (E)	Lat:	Long:	
Project Development:		Lemolo 2	Risk Rating	3	3		Start	43' 21.310"	122' 15.972"	
Nearest Project Feature:		Waterway	Structure Type:	Canal, Access Road			Reference Point			
							End	43' 21.316"	122' 15.852"	
Description of Concern: Potential rockfall hazard from slopes above canal. This site includes Flume 2 failure site. Oversteepened sidecast fill on downslope side of access road. Two major failure areas caused by Flume 2 failure have bare oversteepened slopes immediately above North Umpqua River.										
Proposed Remediation: Place excess fill and regrade failure areas to stable slopes. Provide protection of toe of slope through placement of natural boulders present on site. Place rockfall mesh over 200-ft section of upslope area to mitigate potential for large boulders to bounce as they move down slope. Provide erosion control measures during regrading of eroded areas.										
Remediation Task Breakdown:			Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
Erosion Control							Site contains two erosion treatments listed in the Settlement Agreement: (1) Spoil piles and erosion & sediment control. Priority Rating: High (5) w/ impact (5), Risk (5) (2) Breccia slope over canal, and Priority Rating: High (5) w/ impact (5), Risk (5) Use excavator and bulldozer to establish track that will allow placement of spoil from other areas of project to rebuild slope. Pull existing oversteepened slopes to 1:1.5 grad. Push larger rock and boulders to toe of slope to improve stability, reduce erosion at toe and facilitate drainage. (Cont. on next page)			
Silt Fence			450	LF						
Straw Bales			450	LF						
Site Regrading										
Bulldozer & Operator			24	HR						
Excavator& Operator			24	HR						
Laborer			24	HR						
Borrow Fill From Stockpile			30,000	CY						
Rockfall Fence										
Rockfall Fence 200' long x 70' high			14,000	SF						
Anchors (2 per 10' mesh section)			41	EA						
Slope Revegetation										
Jute Matting			30,000	SF						
Revegetation			30,000	SF						
Data Collection Information:							Mass Bal	Borrow	30,000	CY
Team:	Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees				Excess Fill		CY
Date:	16-Nov-01		Time:	11:00am				Waste		CY

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	LM2-27		Priority Ranking	High (5)	High (5)		Locator Information/GPS		
	(Cont.)						GPS acc. 38' (S) and 138' (E)	Lat:	Long:
			Impact Rating	5	5		Start	43' 21.310"	122' 15.972"
			Risk Rating	5	5		Reference Point		
Project Development:	Lemolo 2		Structure Type:	Canal, Access Road			End	43' 21.316"	122' 15.852"
Nearest Project Feature:	Waterway								
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
						<p>Aquatic connectivity sites L11, L12 and L13 lie within the area of this site. Issues related to future modifications planned to restore aquatic connectivity have not been taken into account in evaluating erosion mitigation measures. Final design of aquatic connectivity measures at this site may result in modifications to the dimensions and limits of the proposed treatments.</p>			
Data Collection Information:						Mass Bal	Borrow	30,000	CY
Team:	Hanek, Moen, Hansen	Weather:	Overcast, 45 degrees				Excess Fill		CY
Date:	16-Nov-01	Time:	11:00am				Waste		CY

LM2-27 Site Plan

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North Umpqua Hydroelectric Project
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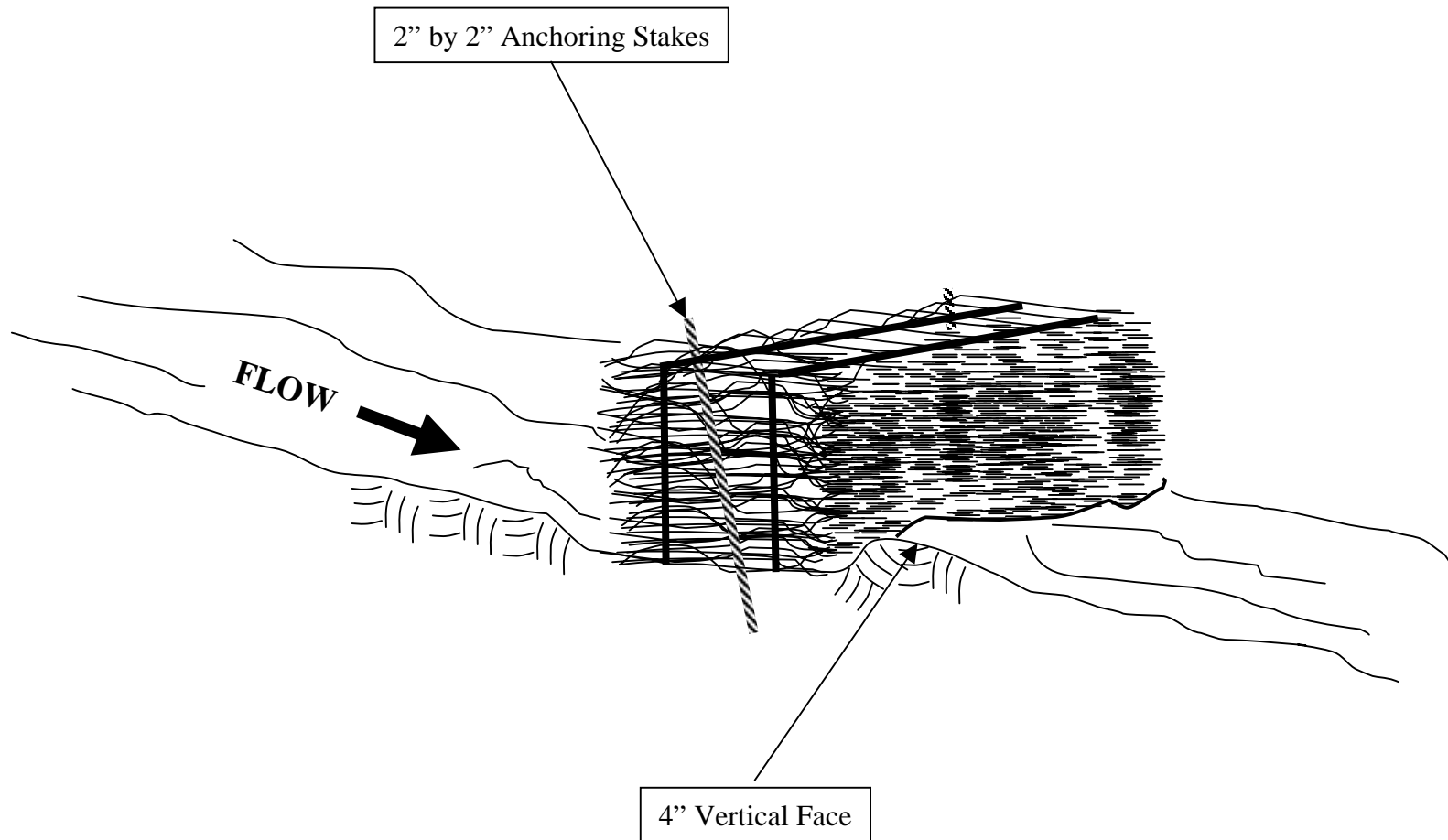
Base map from Project
Boundary maps
Exhibit G of license
application

03/11/2004

Revised: 9/9/2002

LM2-27 Site Plan

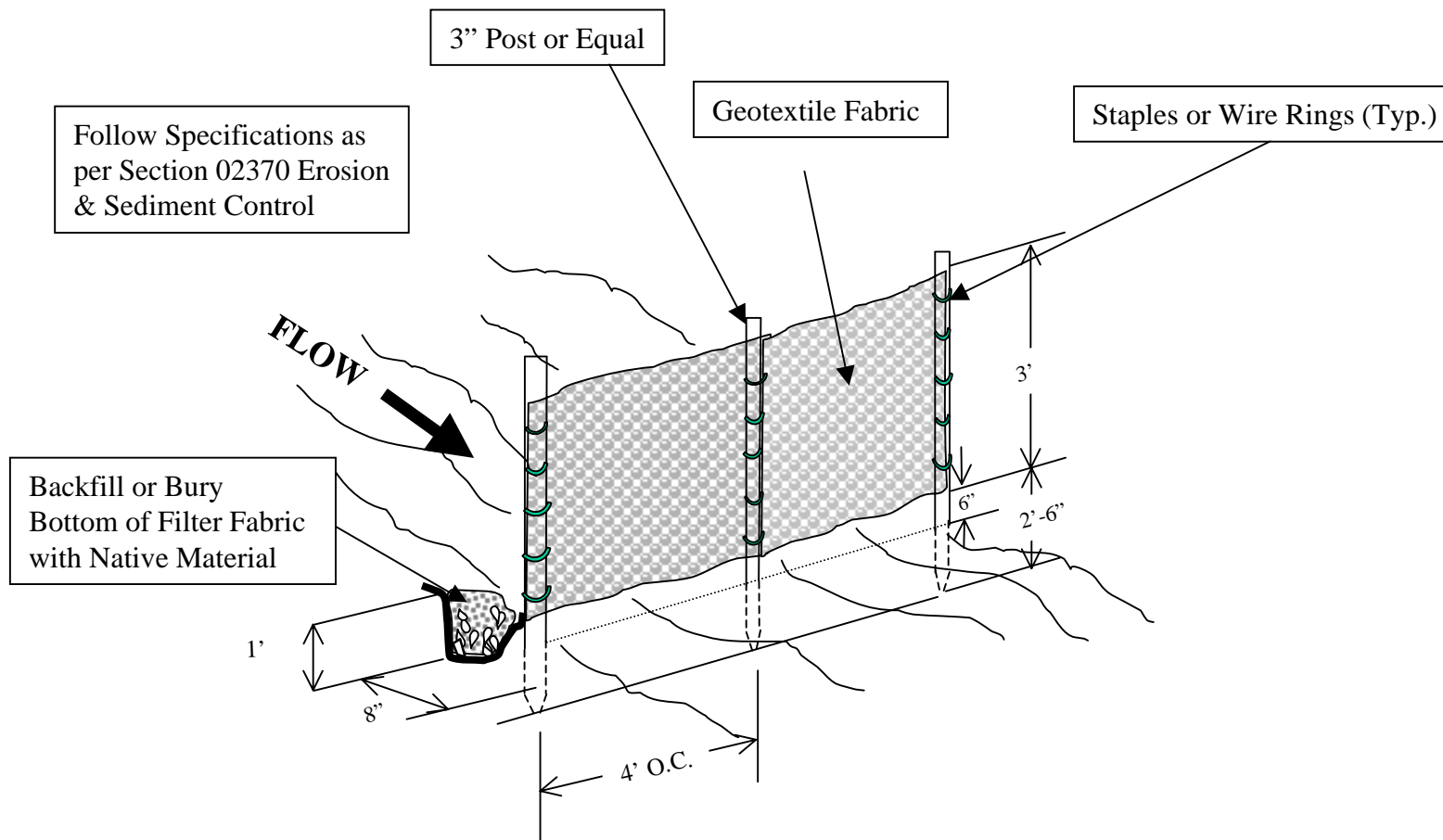
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Typical Straw Bale

LM2-27 Site Plan

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North Umpqua Hydroelectric Project
FERC Project No. 1927



Typical Silt Fence

LM2-27 Site Photos

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



Looking East at western
erosion gully resulting from
failure of Flume 2.

LM2-27 Site Photos

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927

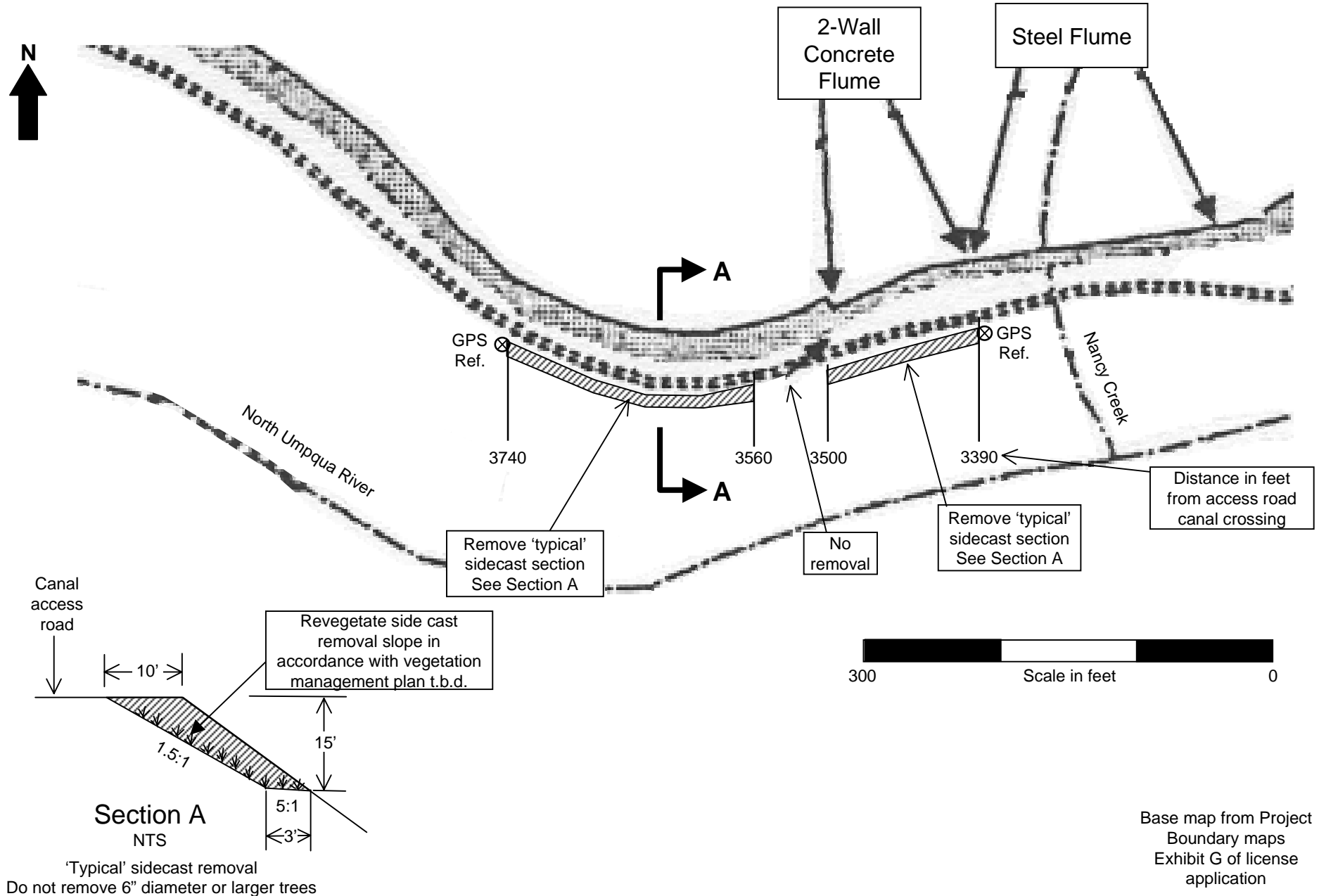


North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	LM2-28		Priority Ranking	High		Locator Information/GPS			
			Impact Rating	3		GPS - 26' (End) accuracy	Lat:	Long:	
			Risk Rating	2		Start	43' 21.286"	122' 15.789"	
Project Development:		Lemolo 2				Reference Point			
Nearest Project Feature:		Waterway	Structure Type:		Access Road	End	43' 21.272"	122' 15.727"	
Description of Concern: Oversteepened sidecast with 80% slopes.									
Proposed Remediation: Remove sidecast from two segments of access road. Removal areas are from 3390 to 3500 ft (measured from access road bridge over canal at LM2 diversion point) and 3560 to 3740 ft. See sketch. Remove 'typical' sidecast prism: 15 ft horizontal distance, cut to 1.5:1 slope with flatter toe area, as shown on sketch.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
Sidecast Removal						Areas where ground is disturbed by sidecast removal will be protected with jute mats or other comparable erosion control measure until vegetation planting or other ground cover is provided in accordance with the VMP. Leave 6" and larger diameter trees and their roots undisturbed during sidecast removal.			
Excavation		1,000	CY						
Excess fill to stockpile		900	CY						
Waste disposal		100	SF						
Slope Revegetation									
Jute Matting		8,700	SF						
Revegetation		8,700	SF						
Data Collection Information:						Mass Bal	Borrow		CY
Team:	Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees			Excess Fill	900	CY
Date:	16-Nov-01		Time:	12:00am			Waste	100	CY

LM2-28 Site Plan

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FERC Project No. 1927



03/11/2004

Revised: 6/28/2002

LM2-28 Site Photo

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North Umpqua Hydroelectric Project
FERC Project No. 1927



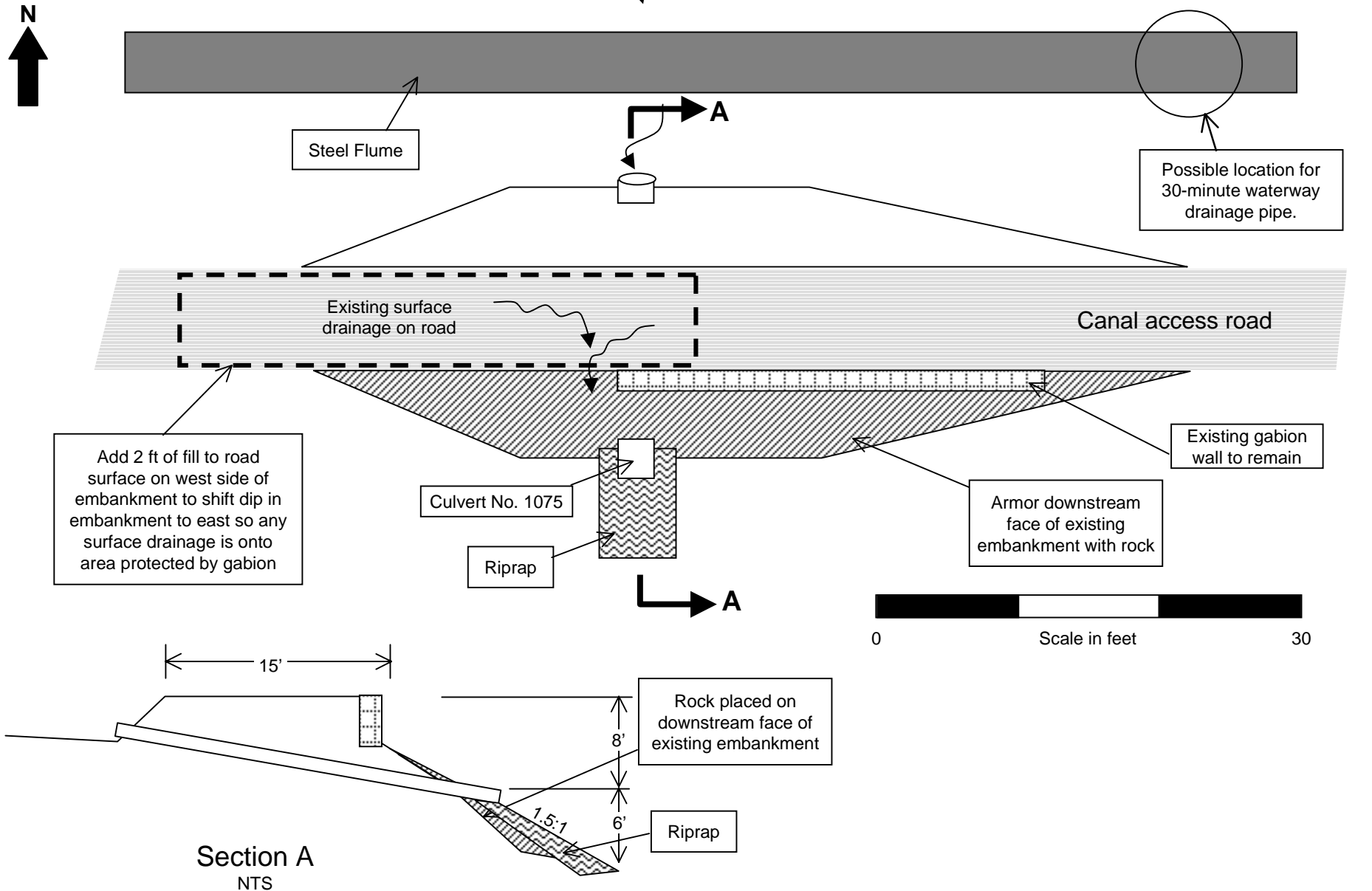
View of eastern (upstream)
end of LM2-28 looking
towards Nancy Creek

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	LM2-29		Priority Ranking	Med		Locator Information/GPS			
			Impact Rating	2		GPS shows 36' accuracy	Lat:	Long:	
			Risk Rating	2		Start			
Project Development:		Lemolo 2				Reference Point	43' 21.277"	122' 15.680"	
Nearest Project Feature:		Waterway	Structure Type:	Access Road, Culvert		End			
Description of Concern: Nancy Creek crossing. Potential fill failure or debris flow plugging culvert, also sidecast fill failure potential, shotgun culvert outlet. Existing culvert is 36" diameter. Culvert under Nancy Creek is number 1075.									
Proposed Remediation: Replace culvert if culvert analysis indicates that it is undersized. Raise road surface on west end of approach approximately 2 ft to ensure proper surface drainage and to ensure that low spot in embankment is in area protected by gabion wall. Place rock on D/S slope of existing slope and fill in area under shotgun culvert. See sketch.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
Buttress Fill						Nancy Creek crossing. Proposed location for 30-minute waterway drainage pipe. Additional engineering investigations and designs to be completed for drainage pipes. Design process will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may include additional erosion control measures.			
Clear slope		850	SF						
Waste disposal		5	CY						
Pitrun rockfill 10" minus		80	CY						
Riprap 1.5'-3' rock		10	CY						
Regrade Road						Method for placement of riprap on downstream face of embankment to be determined during final design, but may include benching and layer placement, end dumping, clamshell or other methods.			
Fill material imported from other sites		50	CY						
Grader		4	HR						
Roadbed 1" minus pitrun		10	CY						
Data Collection Information:						Mass Bal	Borrow		CY
Team:	Hanek, Moen, Hansen	Weather:	Overcast, 45 degrees				Excess Fill		CY
Date:	16-Nov-01	Time:	12:30am				Waste	5	CY

LM2-29 Site Plan Nancy Creek

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North Umpqua Hydroelectric Project
FERC Project No. 1927



LM2-29 Site Photos Nancy Creek

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927

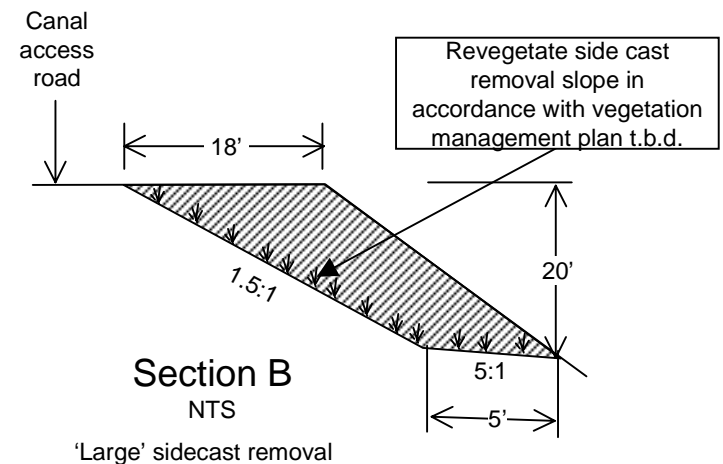
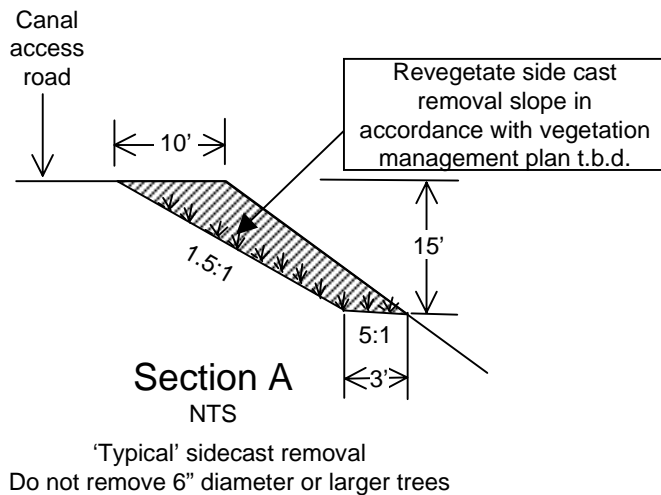
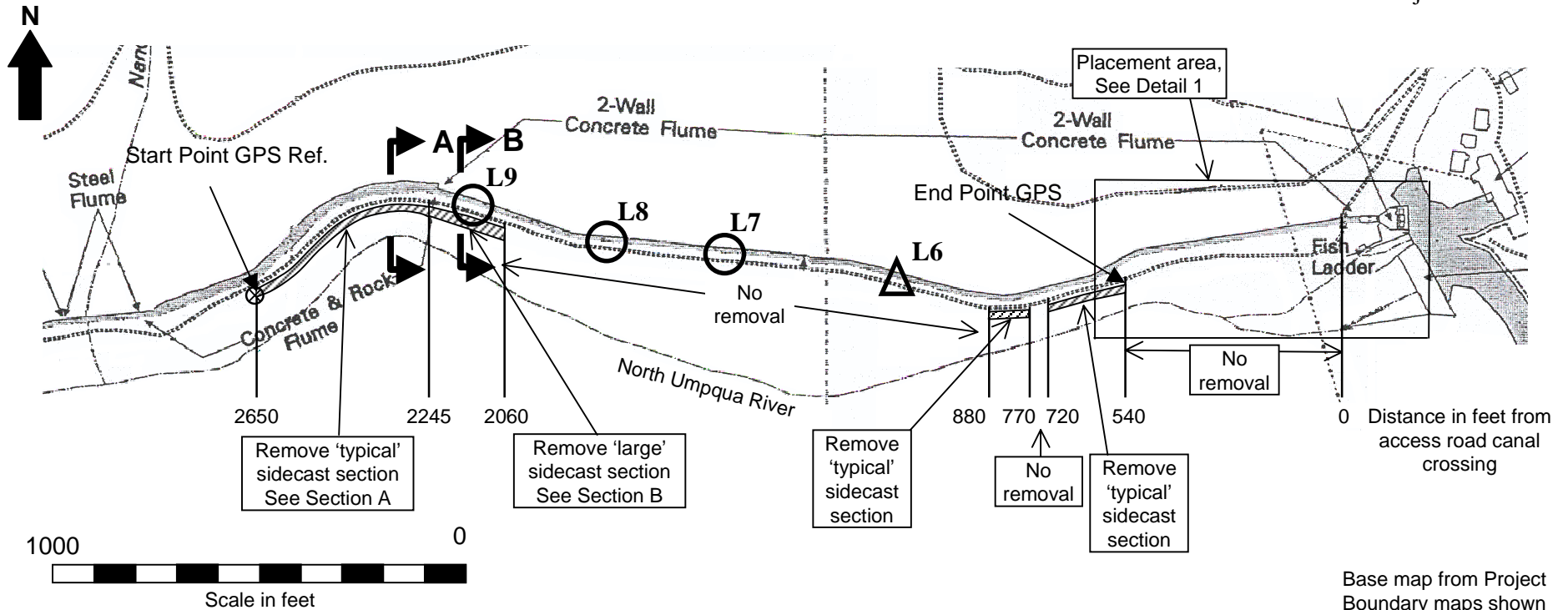


North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	LM2-30		Priority Ranking	Med	Med		Locator Information/GPS			
			Impact Rating	2	2		GPS acc. 31' (S) & 19' (E)	Lat:	Long:	
			Risk Rating	2	2		Start	43' 21.315"	122' 15.575"	
Project Development:		Lemolo 2	Structure Type:		Canal, Access Road		Reference Point			
Nearest Project Feature:		Waterway					End	43' 21.311"	122' 15.118"	
Description of Concern: Breccia in slope above canal with potential to cause damage due to boulders rolling or bouncing into canal. Oversteepened sidecast in areas below access road. Patches in canal wall where past boulder impacts have damaged concrete and been repaired. Three or four noted. Poor drainage along access road surface - several areas of standing water.										
Proposed Remediation: Model upslope geometry to assess rockfall hazard and potential for additional damaging events. Place rockfall protection netting over 200 lineal ft of upslope area (60-ft high netting). Selectively remove sidecast from areas below road, as shown on sketch. Use sidecast to raise access road surface 3 to 4 ft and provide improved drainage. See sketch for areas of 'typical' sidecast removal and 'large volume' sidecast removal.										
Remediation Task Breakdown:			Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
Rockfall Fence							Aquatic connectivity sites L6, L7, L8, and L9 lie within the area of this site. Issues related to future modifications planned to restore aquatic connectivity at this site have not been taken into account in evaluating erosion mitigation measures at this site. Final design of aquatic connectivity measures at this site may result in modifications to the dimensions and limits of the proposed treatments			
Rockfall Fence 200' Long x 60' High			12,000	SF						
Anchors (2 per 10' mesh section)			41	EA						
Sidecast Removal										
Excavation			4,500	CY						
Use as padding material (or stockpile)			4,100	CY			In areas of sidecast removal, leave 6" and larger diameter trees and their roots undisturbed. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments.			
Waste disposal			400	CY						
Regrade Road										
Spread Material (from sidecast removal)			1,300	CY						
Grader			6	HR						
Roadbed 1" minus pitrun			100	CY						
Slope Revegetation										
Jute Matting (sidecast section)			26,000	SF						
Revegetation (sidecast section)			26,000	SF						
Data Collection Information:							Mass Bal	Borrow		CY
Team:	Hanek, Moen, Hansen		Weather:	Overcast, 45 degrees				Excess Fill	2,800	CY
Date:	16-Nov-01		Time:	1:00pm				Waste	400	CY

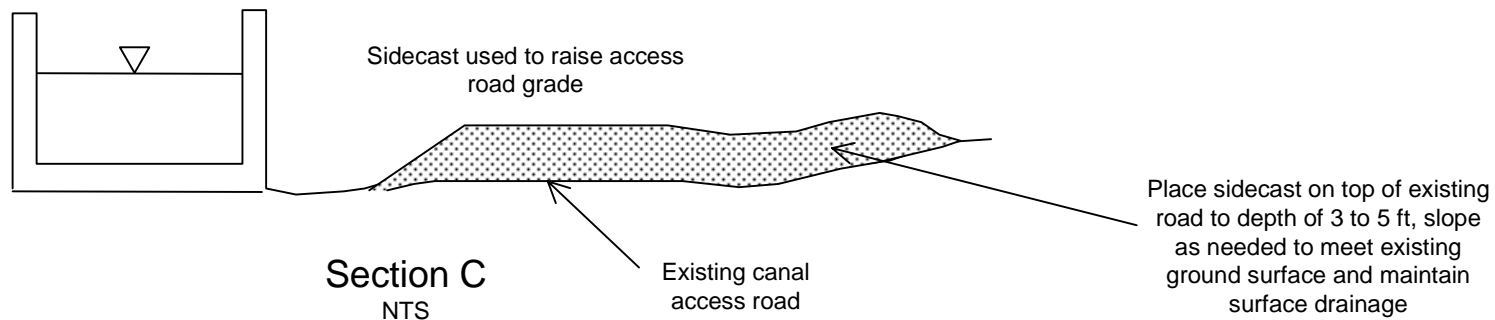
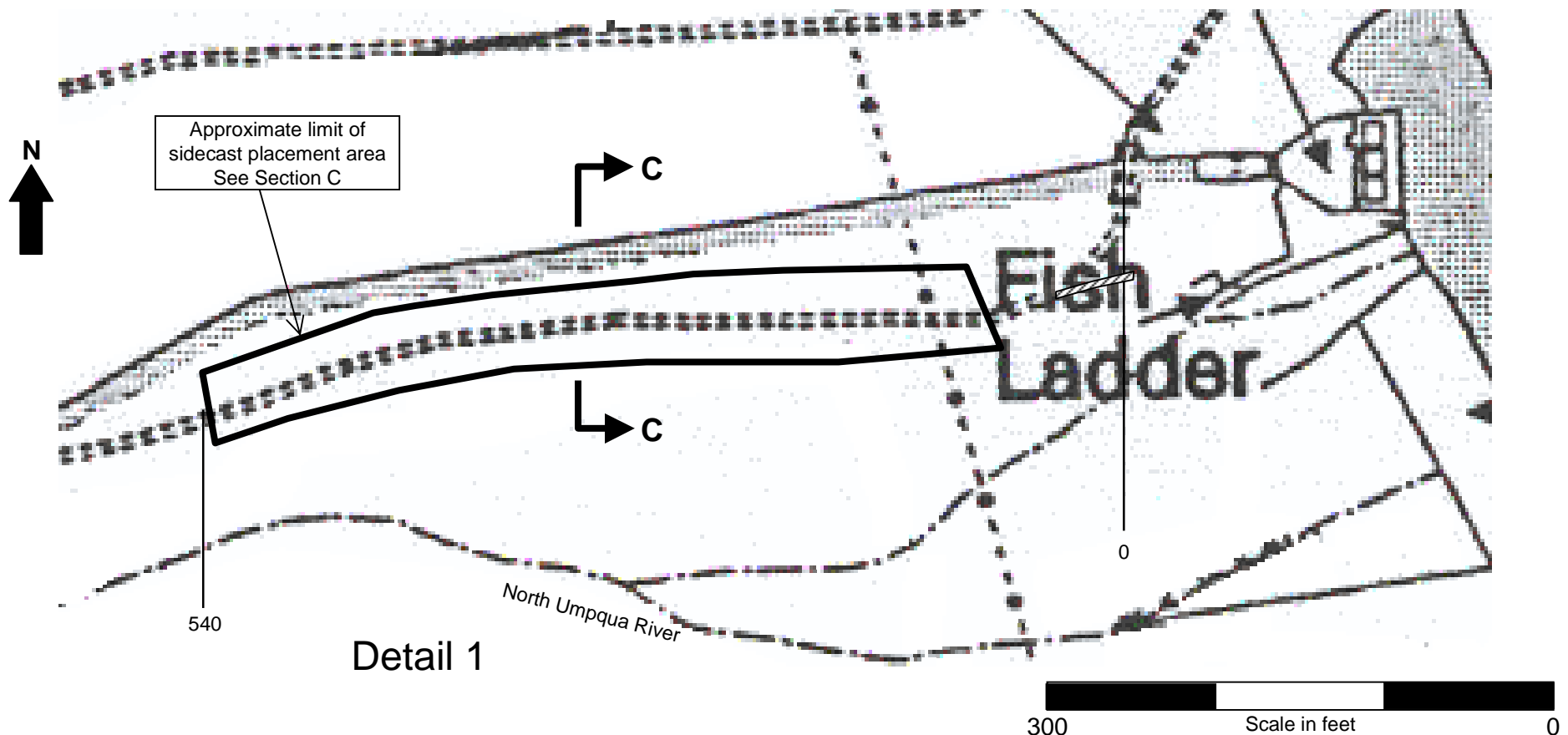
LM2-30 Site Plan

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



LM2-30 Site Plan

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



Base map from Project
Boundary maps shown
in Exhibit G of license
application

03/11/2004

Revised: 6/28/2002

LM2-30 Photos

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927

Mudflow breccia above
canal, potential for
boulders falling into canal.



View of over
steep sidecast
below road

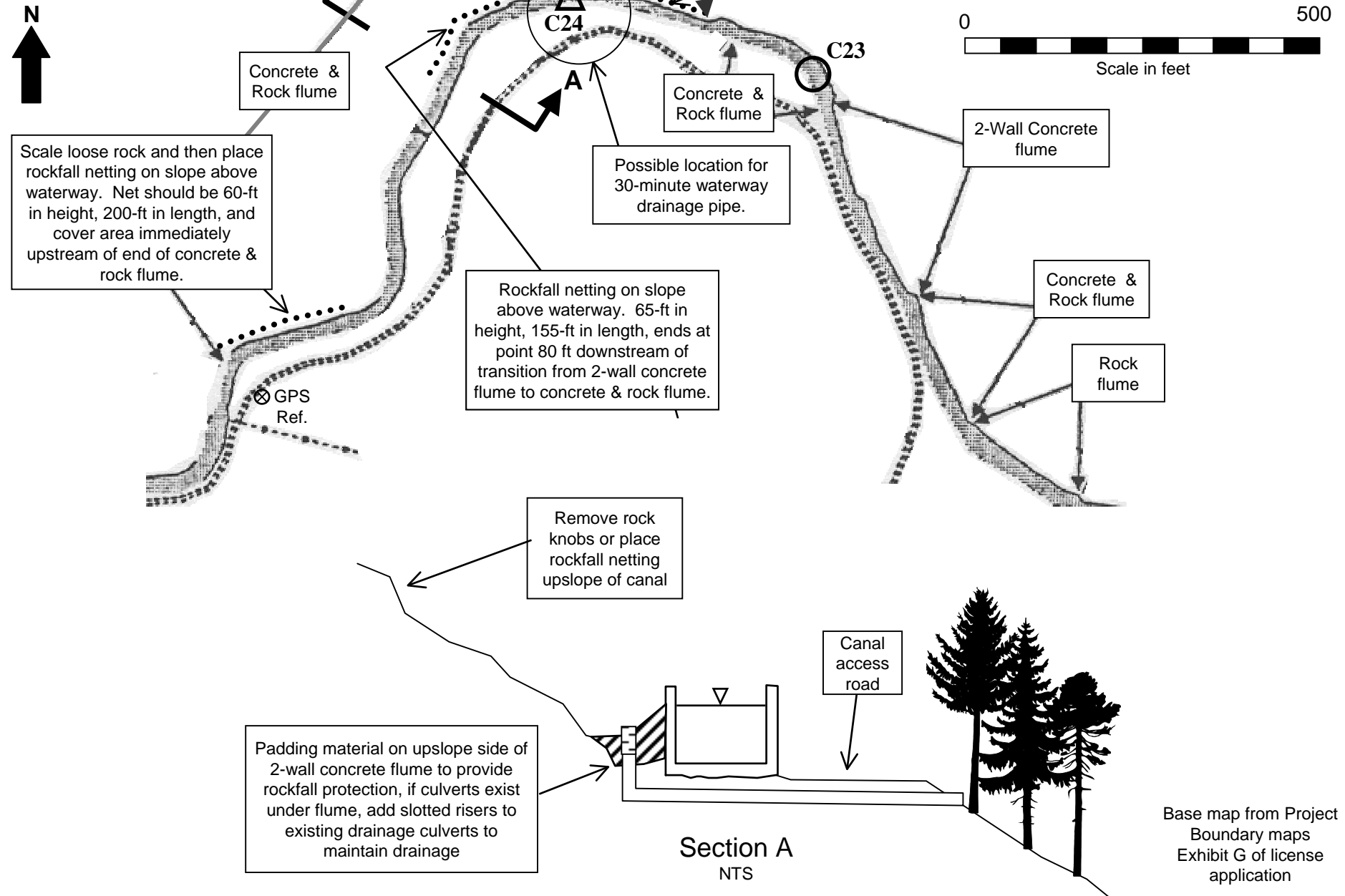


North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	CW2-1		Priority Ranking	Med		Locator Info/GPS		
			Impact Rating	2		GPS shows 18' accuracy	Lat:	Long:
			Risk Rating	2		Start		
Project Development:		Clearwater 2				Reference Point		
Nearest Project Feature:		Waterway	Structure Type:		Double wall concrete flume.	End	43' 15.583"	122' 23.716"
Description of Concern: Basalt outcrop with unfavorable joint orientation above canal. Joint orientations vary along length of outcrop. Outcrop at eastern end of site is 80 to 100-ft high, but generally massive and shows little evidence of past failures. Higher rockfall hazard is present at western end, where joint orientation creates potential for rock blocks sliding into waterway.								
Proposed Remediation: Provide protection against rockfall damage to flume through installation of rockfall netting along a 200-ft section of waterway at the western end of the concrete and rock flume section. Scale loose rock before placing netting. Net will be 60-ft in height. Also place 65-ft high, 155-ft long rockfall net at upper end of concrete and rock flume, beginning 80 ft downstream of transition from 2-wall concrete flume and continuing downstream. In addition, place rockfall padding along 90-ft section of 2-wall concrete flume, at location shown on sketch.								
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches		
						Additional engineering investigations and designs to be completed for drainage pipes. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments. Aquatic connectivity sites C23 and C24 lie within the area of this site. Issues related to future modifications planned to restore aquatic connectivity at this site have not been taken into account in developing proposed erosion mitigation measures at this site. Final design of aquatic connectivity measures at this site may result in modifications to the dimensions and limits of erosion treatments shown.		
Slope Scaling								
Cherry Picker		16	HR					
Load and Haul Scaled Material		20	CY					
Padding of Upslope Canal Wall w/ Fill								
Clean/Locate Risers at Padding Area		2	EA					
Riser pipes 24" dia. 4' high (assumed)		2	EA					
Pipe Bedding/Wall Drainage Rock (5CY/Riser)		10	CY					
Fill Padding 90' (2CY/FT)		180	CY					
Rockfall Fence								
Rockfall Fence 200' Long X 60' High		12,000	SF					
Fence Anchors (2 Anchor per 10' Length)		41	EA					
Rockfall Fence 155' Long X 65' High		10,000	SF					
Fence Anchors (2 Anchor per 10' Length)		33	EA					
Data Collection Information:						Mass Bal	Borrow	180 CY
Team:	Hansen, Moen, Denq	Weather:	Clear, cool				Excess Fill	CY
Date:	7-May-02	Time:	8:00am				Waste	20 CY

CW2-1 Site Plan

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



CW2-1 Site Photos

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



View east along Clearwater 2 canal in area of concrete and rock flume at west end of site.

Representative view north across canal at east end of site, in area where rockfall padding will be placed on upslope side of 2-wall concrete flume.

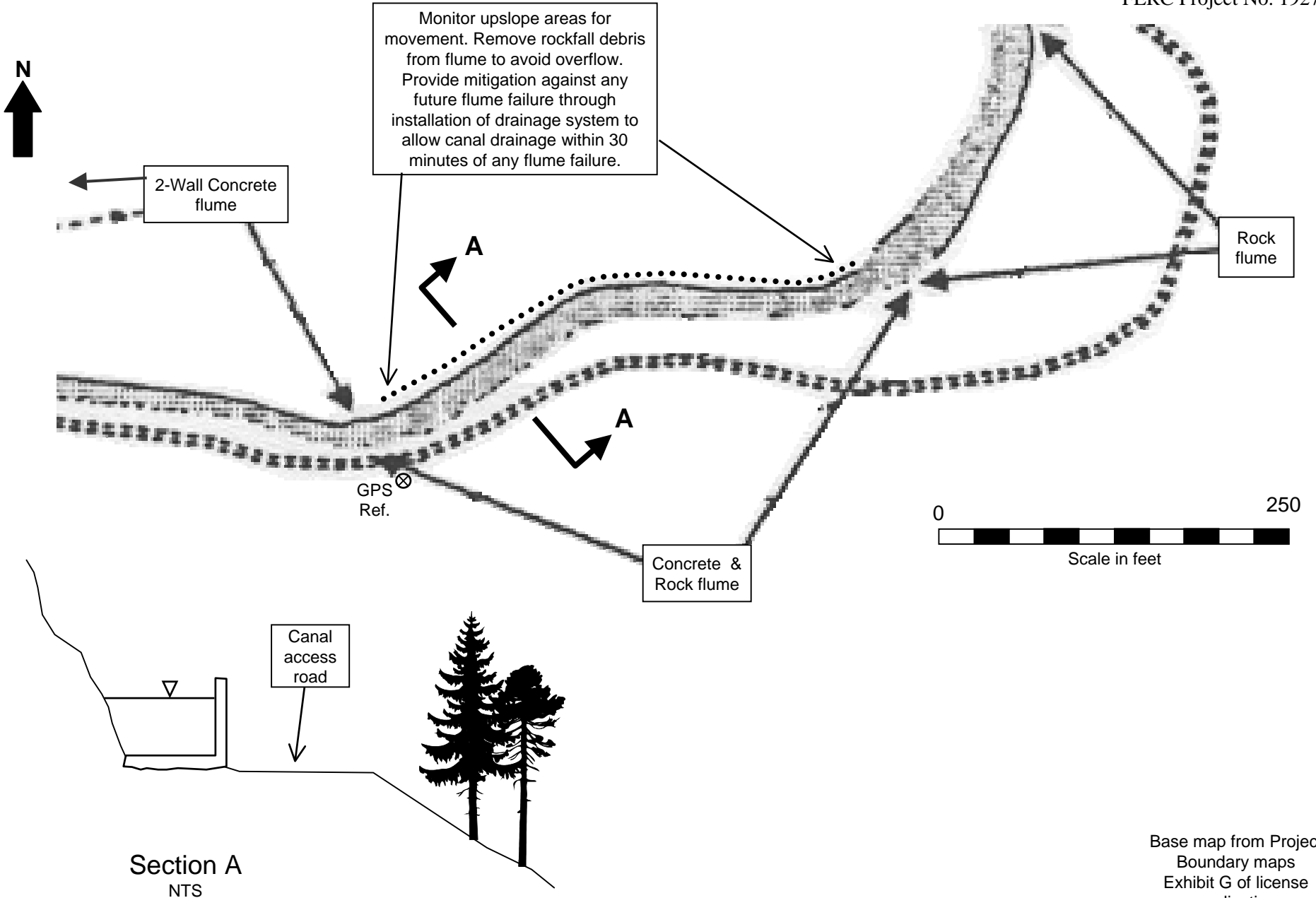


North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	CW2-2		Priority Ranking	Med		Locator Information/GPS					
			Impact Rating	2		Start			Lat:	Long:	
Project Development:			Clearwater 2	Risk Rating	2	Reference Point					
Nearest Project Feature:			Waterway	Structure Type:	Double wall concrete flume.	End			43' 15.312"	122' 23.412"	
Description of Concern: Mudflow Breccia with small slumps and wedges. Rockfall into waterway could cause partial blockage of flow.											
Proposed Remediation: Install drainage system that will allow canal to be drained within 30-minutes. Monitor slope above canal for signs of failure, however slope is only approximately 35-ft in height and failure of isolated blocks is unlikely to cause major blockage within canal. Daily canal inspections will identify any significant rockfall and develop plans for removal when needed.											
Remediation Task Breakdown:			Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches				
NA											
Data Collection Information:											
Team:	Hansen, Moen, Denq	Weather:	Clear, cool								
Date:	7-May-02	Time:	2:20								
						Mass Bal	Borrow		CY		
							Excess Fill		CY		
							Waste		CY		

CW2-2 Site Plan

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



3/11/2004

Revised: 6/28/2002

CW2-2 Site Photo

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North Umpqua Hydroelectric Project
FERC Project No. 1927

Representative view north across canal showing concrete and rock flume. Mitigation to be provided through installation of drainage system that will allow canal to be drained within 30 minutes.

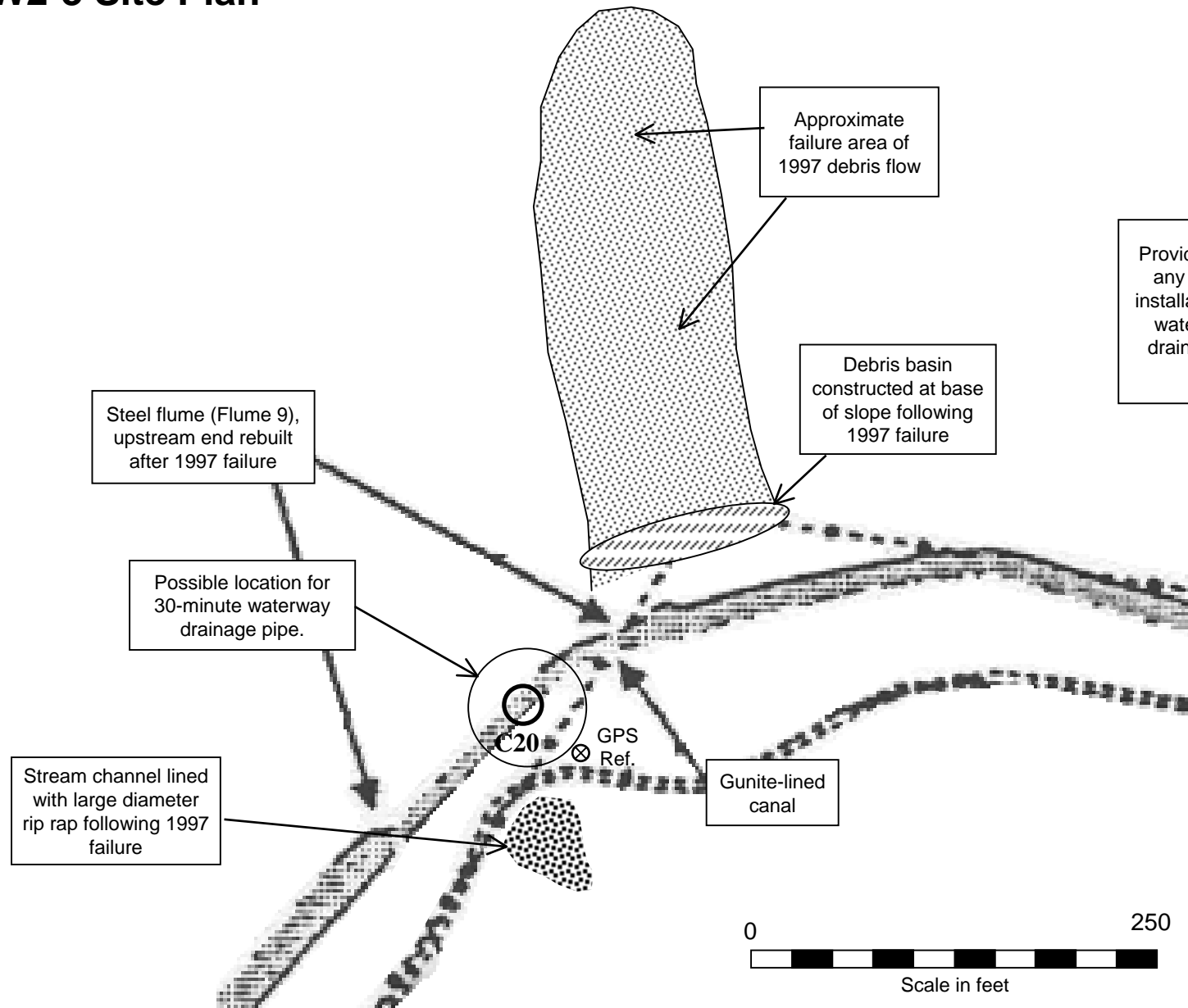


North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	CW2-3		Priority Ranking	Med		Locator Information/GPS		
			Impact Rating	3		Start	Lat:	Long:
Project Development:		Clearwater 2	Risk Rating	1		Reference Point	43' 15.415"	122' 23.167"
Nearest Project Feature:		Waterway	Structure Type:		Gunite lined canal, Trestle	End		
Description of Concern: 1997 Flume failure location.								
Proposed Remediation: Thirty minute canal drainage system will mitigate against future slope failures. No additional measures planned for this site.								
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches		
NA						<p>Additional engineering investigations and designs to be completed for drainage pipes. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may include erosion control measures in addition to the construction of the 30-minute drainage system.</p> <p>Aquatic connectivity site C20 is located within the area of this site. Issues related to future modifications planned to restore aquatic connectivity at this site have not been taken into account in evaluating the need for additional erosion mitigation measures. Final design of aquatic connectivity measures at this site may include erosion control measures in addition to the construction of the 30-minute drainage system.</p>		
Data Collection Information:						Mass Bal	Borrow	CY
Team:	Hansen, Moen, Denq	Weather:	Clear, cool				Excess Fill	CY
Date:	7-May-02	Time:	2:15				Waste	CY

CW2-3 Site Plan

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



Provide mitigation against effects of any future slope failures through installation of drainage system along waterway which will allow canal drainage within 30 minutes of any flume failure.

Base map from Project
Boundary maps
Exhibit G of license
application

3/11/2004

Revised: 6/28/2002

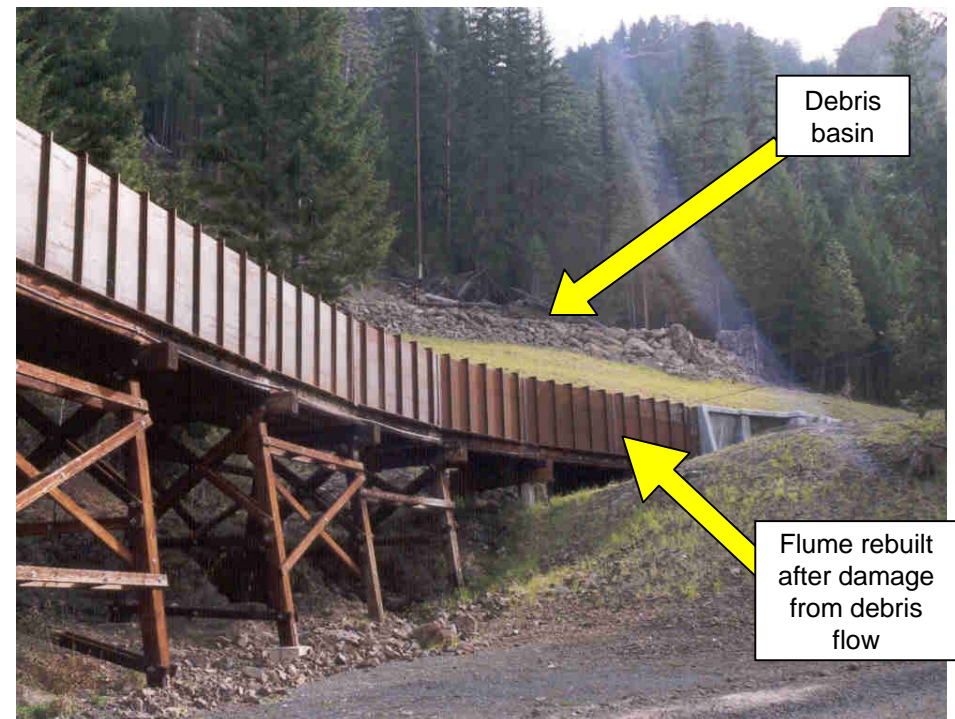
CW2-3 Photos

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



View north across canal showing area of 1997 debris flow. Mitigation to be provided through installation of drainage system that will allow canal to be drained within 30 minutes.

Debris catch basin at base of slope.



Debris basin

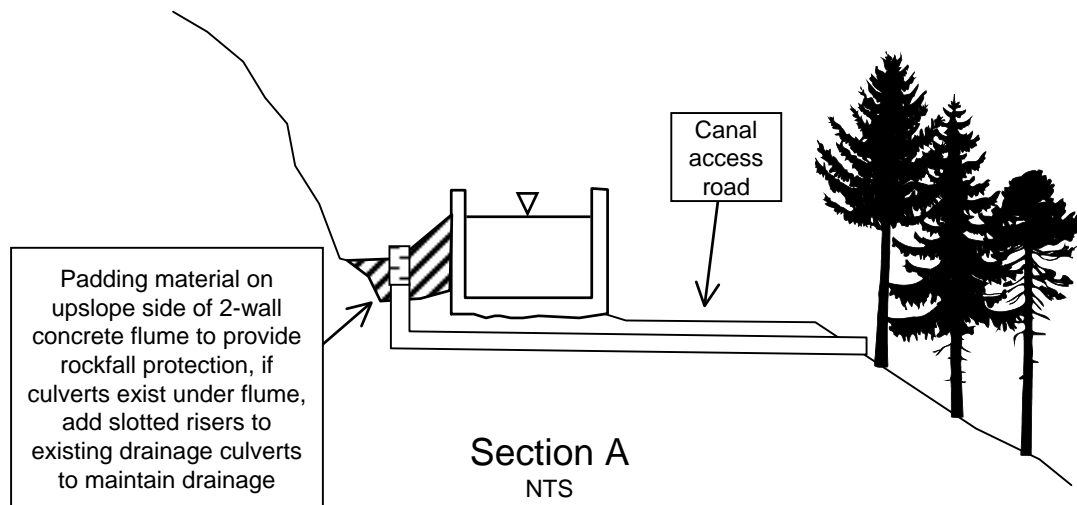
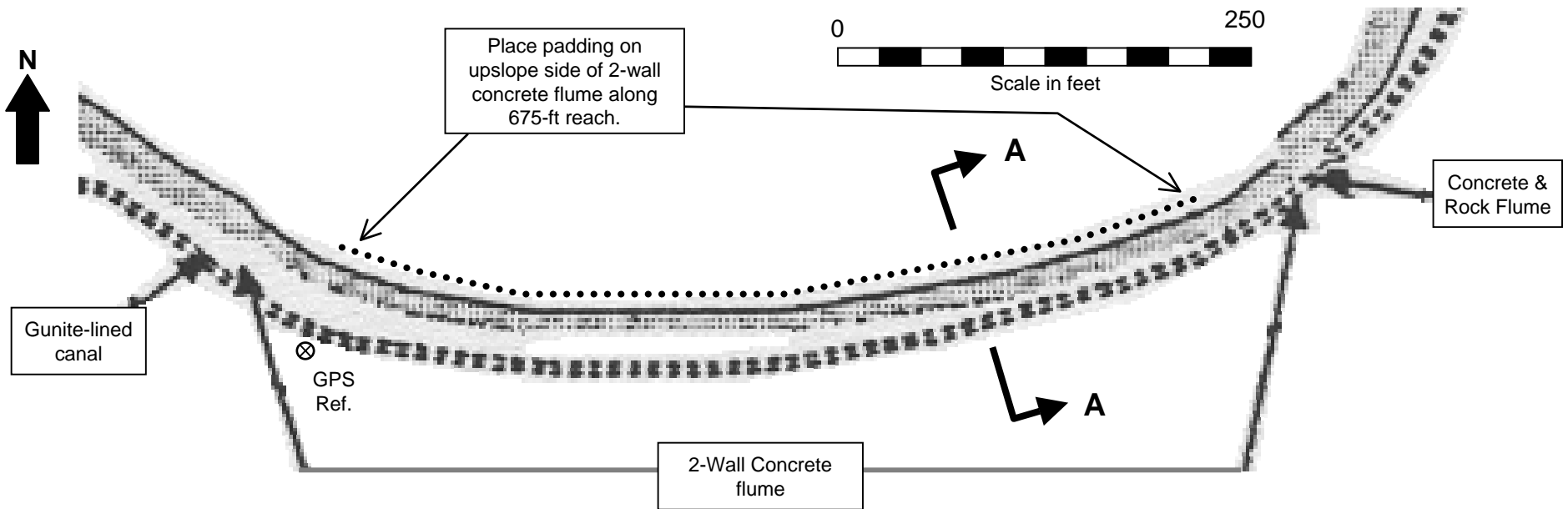
Flume rebuilt after damage from debris flow

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	CW2-4		Priority Ranking	High		Locator Info/GPS	GPS	Lat:	Long:
			Impact Rating	3		shows 20' accuracy			
Project Development:	Clearwater 2		Risk Rating	3		Start			
Nearest Project Feature:	Waterway		Structure Type:	Double wall concrete flume.		Reference Point			
Description of Concern: Mudflow Breccia above canal, slopes 30' high, erosion below road from overflow during Flume 9 failure.						End		43' 15.289"	122' 22.906"
Proposed Remediation: Fill padding on upslope side of canal over a 675-ft-long reach. Add riser pipes to existing culverts for drainage under canal. Additional mitigation provided through installation of 30-minute drainage system. Visually monitor upslope areas for signs of rockfall and implement additional measures if appropriate. Access to upslope areas very difficult due to high cliffs.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
Padding of Upslope Canal Wall w/ Fill						<p>Prior to construction of erosion mitigation measures, agency personnel will review draft designs as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments.</p> <p>Consider the economic and engineering feasibility of a sloped canal cover to deflect falling rocks or rockfall fencing placed between the rock slope and inner canal wall.</p>			
Clean/Locate Risers at Padding Area		4	EA						
Riser pipes 24" dia. 4' high (assumed)		4	EA						
Pipe Bedding/Wall Drainage Rock (5CY/Riser)		20	CY						
Fill Padding 675' (2CY/FT)		1,350	CY						
Data Collection Information:						Mass Bal	Borrow	1,350	CY
Team:	Hansen, Moen, Denq	Weather:	Clear				Excess Fill		CY
Date:	7-May-02	Time:	2:30				Waste		CY

CW2-4 Site Plan

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FERC Project No. 1927



Provide additional mitigation against effects of any future slope failures through installation of drainage system along waterway which will allow canal drainage within 30 minutes of any flume failure.
Additional Comments/Sketches

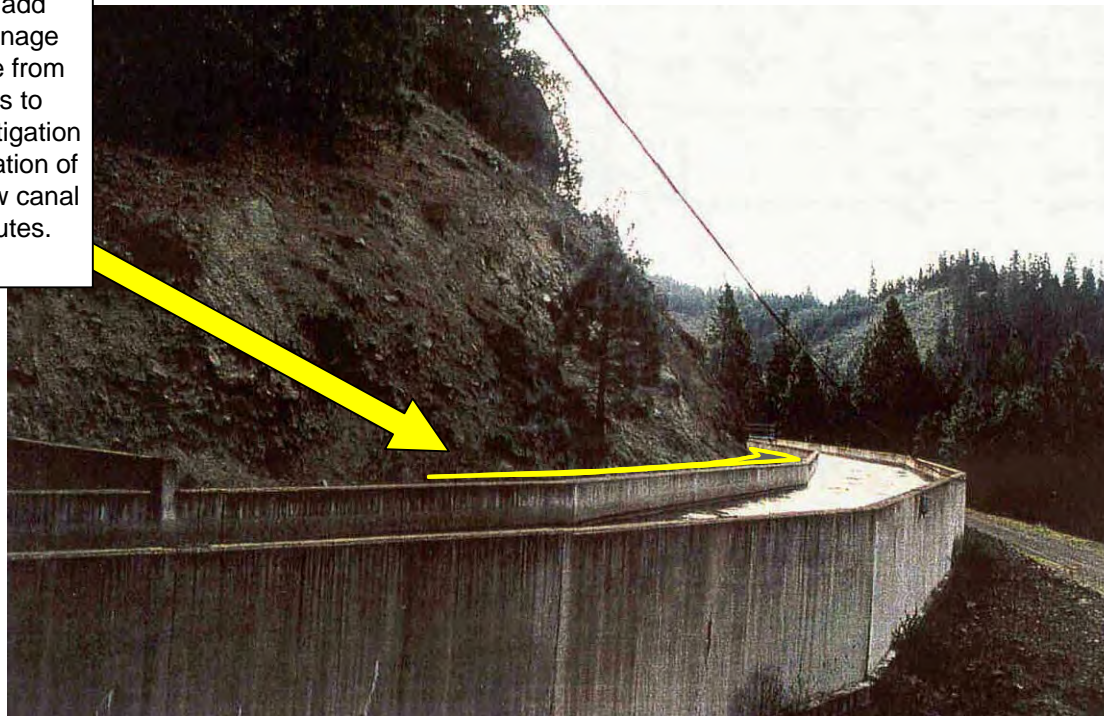
Consider the economic and engineering feasibility of a sloped canal cover to deflect falling rocks or rockfall fencing placed between the rock slope and inner canal wall.

Base map from Project Boundary maps
Exhibit G of license application

CW2-4 Photo

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927

Place padding material on upslope side of 2-wall concrete flume to provide rockfall protection, add slotted risers to existing drainage culverts to maintain drainage from behind flume. Existing trees to remain in place. Additional Mitigation to be provided through installation of drainage system that will allow canal to be drained within 30 minutes.

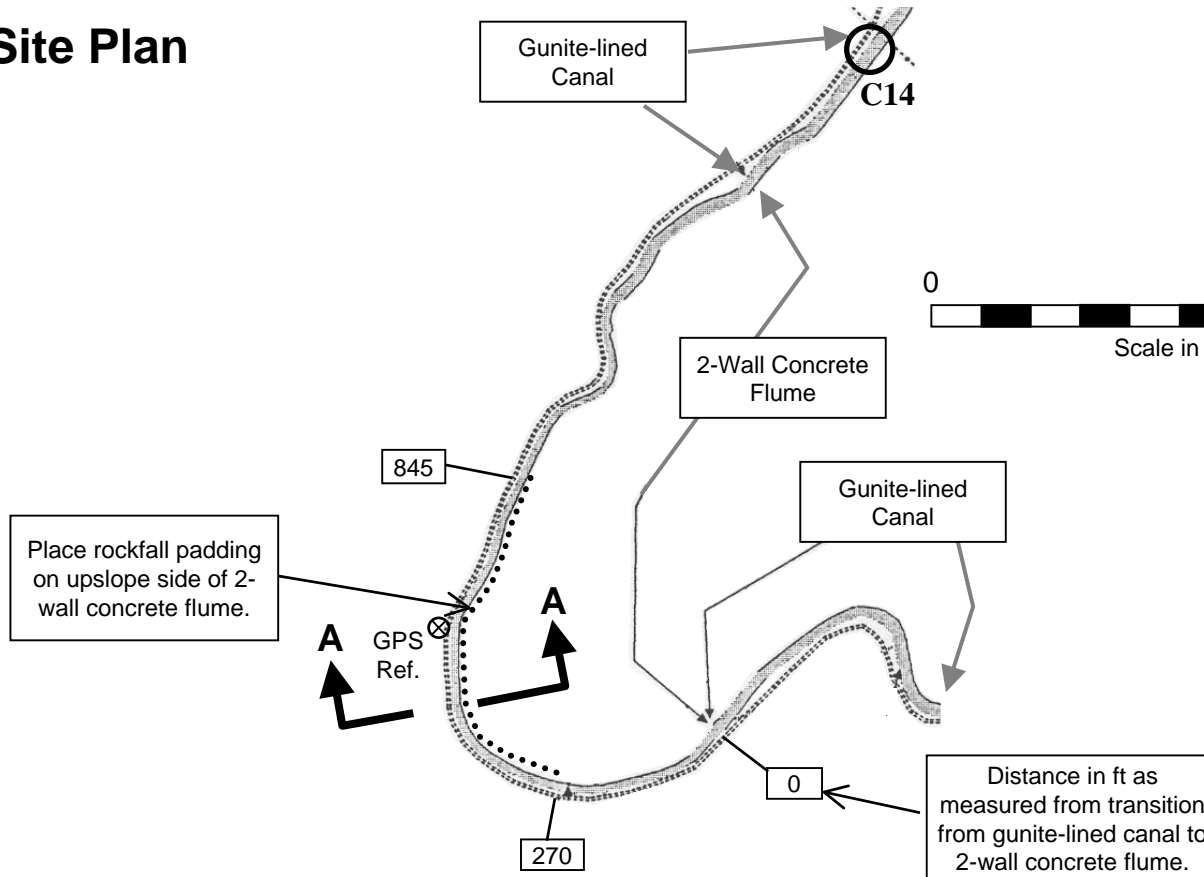
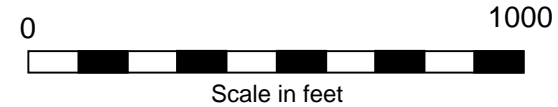


North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	CW2-5		Priority Ranking	High		Locator Info/GPS	GPS	Lat:	Long:
			Impact Rating	3		shows 34' accuracy			
Project Development:	Clearwater 2		Risk Rating	2		Start			
Nearest Project Feature:	Waterway		Structure Type:	Single and double wall conc. flume.		Reference Point		43' 15.046"	122' 22.665"
Description of Concern: Mudflow Breccia above canal 20'-40' high. Rockfall into canal could impact walls and cause leakage.									
Proposed Remediation: Place rockfall padding along 575-ft of 2-wall concrete flume for protection against rocks rolling down slope above waterway.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
Padding of Upslope Canal Wall w/ Fill						<p>Aquatic connectivity site C14 is located a short distance downstream of this site. Issues related to future modifications planned to restore aquatic connectivity at this site have not been taken into account in developing proposed erosion mitigation measures at this site. Final design of aquatic connectivity measures at this site may result in modifications to the dimensions and limits of erosion treatments shown.</p> <p>Prior to construction of erosion mitigation measures, agency personnel will review draft designs as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments.</p>			
Clean/Locate Risers at Padding Area		4	EA						
Riser pipes 24" dia. 4' high (assumed)		4	EA						
Pipe Bedding/Wall Drainage Rock (5CY/Riser)		20	CY						
Fill Padding 575' (2CY/FT)		1,200	CY						
Data Collection Information:						Mass Bal	Borrow	1,200	CY
Team:	Hansen, Moen, Denq	Weather:	Clear				Excess Fill		CY
Date:	7-May-02	Time:	3:30				Waste		CY

CW2-5 Site Plan

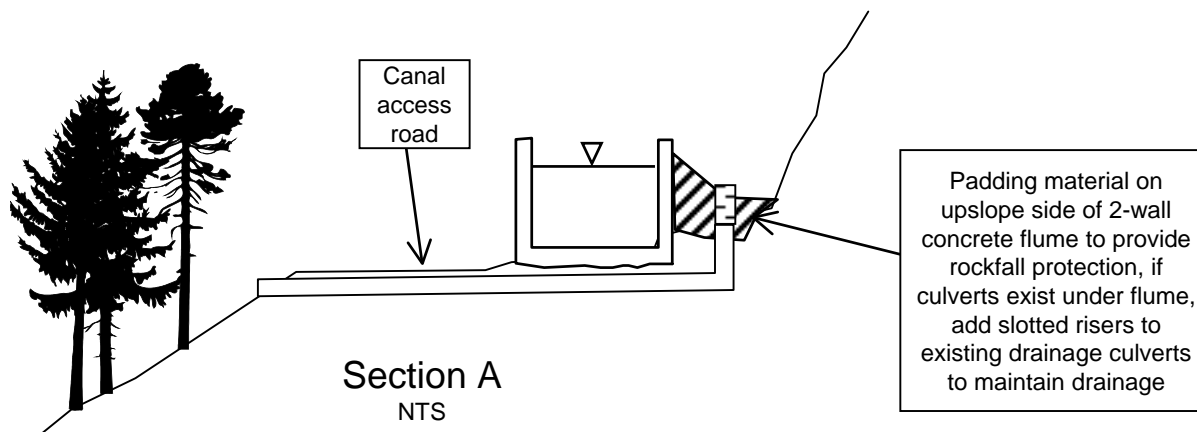
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Place rockfall padding on upslope side of 2-wall concrete flume.

Additional mitigation through installation of drainage system along waterway which will allow canal drainage within 30 minutes of any flume blockage/failure.

Distance in ft as measured from transition from gunitite-lined canal to 2-wall concrete flume.



Base map from Project
Boundary maps
Exhibit G of license
application

CW2-5 Site Photo

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North Umpqua Hydroelectric Project
FERC Project No. 1927



Representative view north across canal showing concrete and rock flume. Mitigation to be provided through installation of drainage system that will allow canal to be drained within 30 minutes. Also place rockfall padding along 2-wall concrete flume (not shown).

North Umpqua Hydroelectric Project (FERC 1927)

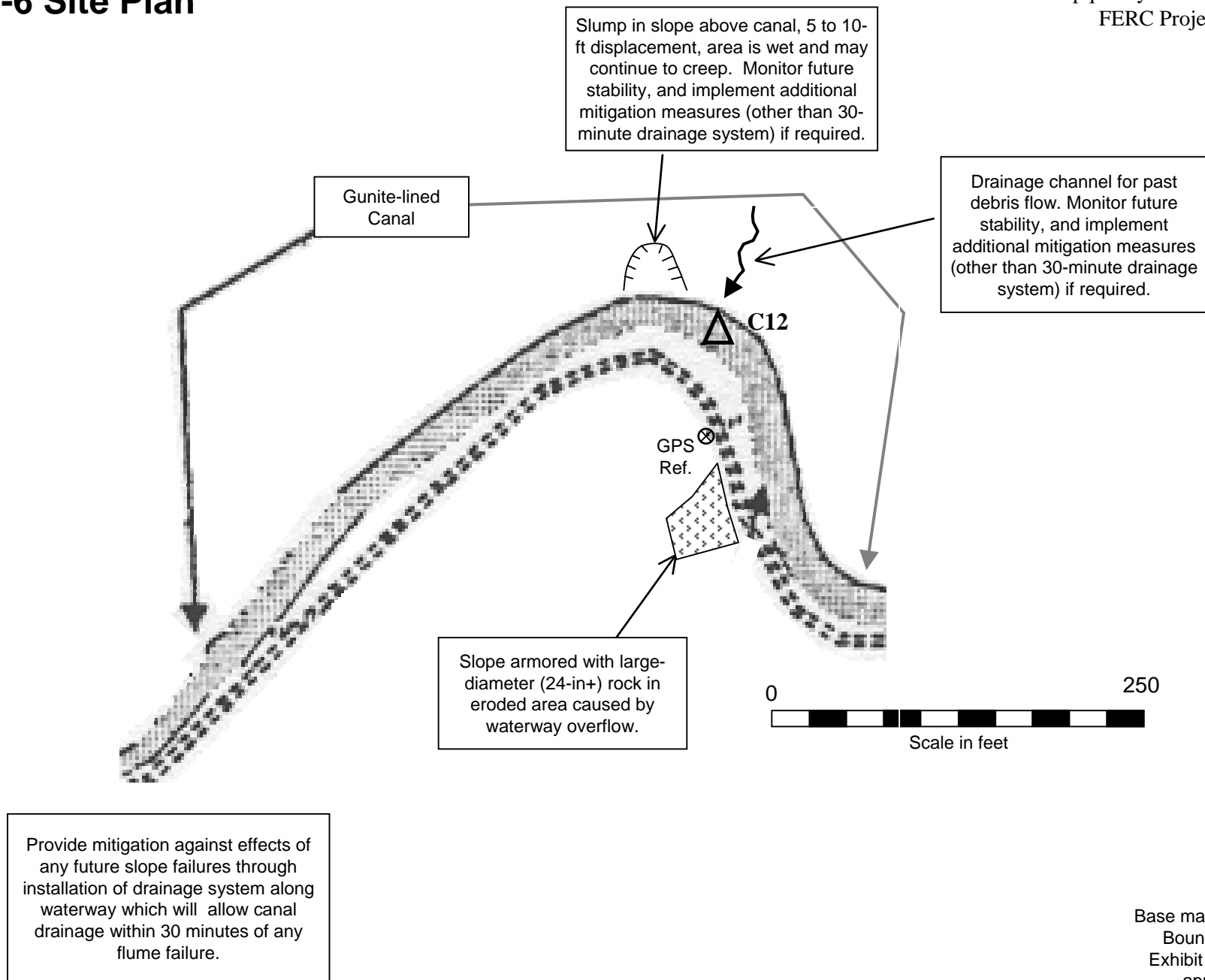
Erosion Control Plan

Site Remediation/ Assessment Form

Site #	CW2-6		Priority Ranking	High		Locator Information/GPS		
			Impact Rating	3		Start	Lat:	Long:
Project Development:		Clearwater 2	Risk Rating	3		Reference Point	43' 14.945"	122' 22.533"
Nearest Project Feature:		Waterway	Structure Type:		Gunite lined canal	End		
Description of Concern: Two small gullies with debris flows. Debris flow in eastern gully in late 1990's caused blockage in canal and partial overflow approximately 100 ft upstream of this location.								
Proposed Remediation: No measures other than installation of 30-minute waterway drainage system. Visually monitor site as part of daily and annual monitoring program. Erosion caused by past debris flow blockage repaired through placement of large-diameter rock on slope (see photo).								
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches		
NA						Aquatic connectivity site C12 is located a short distance downstream of this site. Issues related to future modifications planned to restore aquatic connectivity have not been taken into account in evaluating the need for additional erosion mitigation measures. Final design of aquatic connectivity measures at this site may include erosion control measures in addition to the construction of the 30-minute drainage system.		
Data Collection Information:						Mass Bal	Borrow	CY
Team:	Hansen, Moen, Denq	Weather:	Clear, cool				Excess Fill	CY
Date:	7-May-02	Time:	3:30				Waste	CY

CW2-6 Site Plan

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FERC Project No. 1927



Base map from Project
Boundary maps
Exhibit G of license
application

CW2-6 Site Plan

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FERC Project No. 1927



Debris flow source area and channel above canal.



Debris flow source area for 1997 failure event. Mitigation against effects of future slope failures to be provided through installation of a drainage system along waterway that will allow drainage within 30 minutes of any flume failure.

Slope deformation, monitor for future changes.

Area approximately 100 feet east of debris flow site. Waterway backup caused by debris flow deposit overtopped canal banks and eroded slope below access road. Rock placed to restore slope.

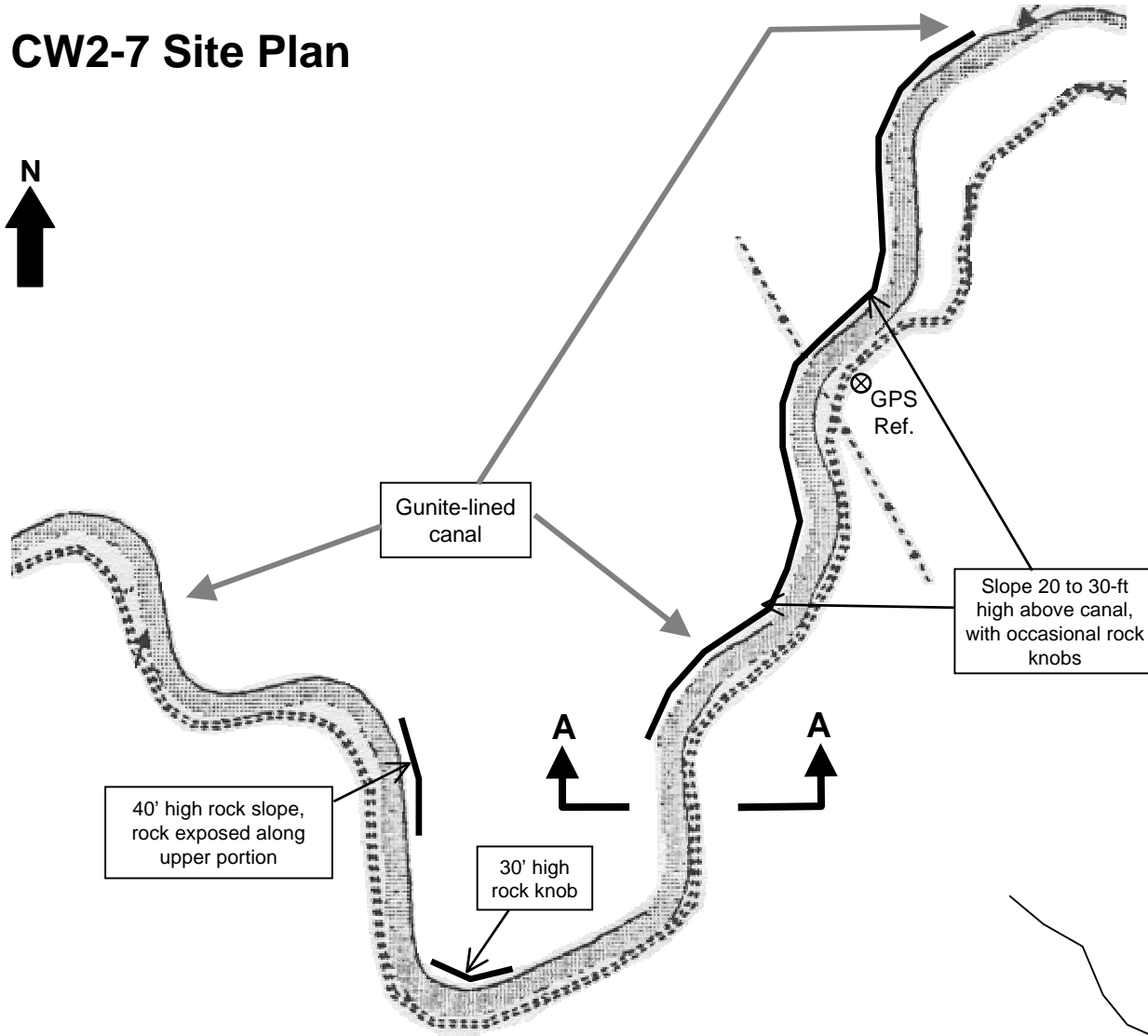


Site Remediation/ Assessment Form

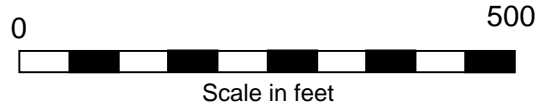
Revised: 4/19/2004

CW2-7 Site Plan

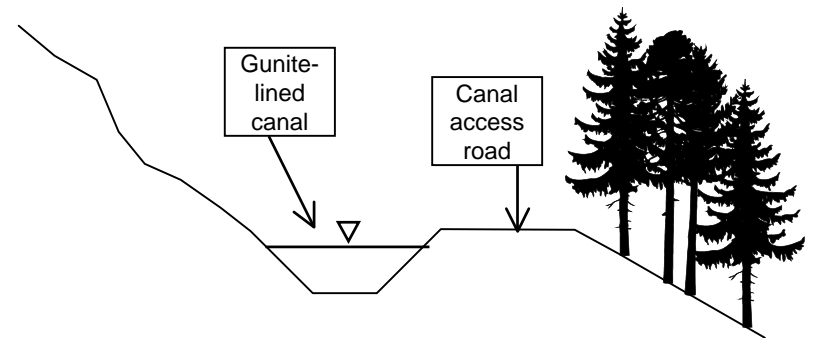
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FERC Project No. 1927



Provide mitigation against effects of any future slope failures through installation of drainage system along waterway which will allow canal drainage within 30 minutes of any flume failure.



Base map from Project
Boundary maps
Exhibit G of license
application



Section A
NTS

CW2-7 Site Photo

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FERC Project No. 1927

Representative view north
across canal showing typical
slope above gunite-lined canal.
Mitigation to be provided through
installation of drainage system
that will allow canal to be drained
within 30 minutes.



North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	CW2-8		Priority Ranking	High		Locator Info/GPS			
			Impact Rating	3		GPS shows 25' accuracy.	Lat:	Long:	
			Risk Rating	3		Start			
Project Development:		Clearwater 2				Reference Point	43' 14.969"	122' 22.256"	
Nearest Project Feature:		Waterway	Structure Type:		Trestle structure, fill	End			
Description of Concern: Road fill failure on downslope side of access road embankment at No Tunnel Creek crossing due to drainage from western side crossing road surface.									
Proposed Remediation: Restore existing access road embankment or rebuild with new culvert if existing 48-inch diameter culvert is found to be undersized. Regrade access road west of embankment to prevent water flow onto road surface, and restore ditch on upslope side of road. This site is also the proposed location for a canal drainage pipe, which would be located at the downstream (west) end of the steel flume structure.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
						Capacity of existing culvert to be evaluated. If capacity is adequate to pass 100-yr flows, embankment remediation will be limited to restoration of downstream face and placement of additional riprap below culvert outlet. If culvert is undersized, embankment and culvert to be replaced.			
Culvert Crossing (assumed quantities)									
Excavation of existing crossing		1,700	CY						
Waste Disposal		100	CY						
New Fill		2,200	CY						
Fill material imported from other sites		600	CY						
Roadbed material 1" minus pitrun		12	FT						
New 48" culvert (if required)		100	CY						
Pipe Bedding		30	CY						
Riprap 1.5'-3' rock		12	CY						
Slope Revegetation						This site is also a proposed location for a 30-minute waterway drainage pipe. Additional engineering investigations and designs to be completed for drainage pipes. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments.			
Jute Matting		1,000	SF						
Revegetation		1,000	SF						
Data Collection Information:						Mass Bal	Borrow	600	CY
Team:	Hansen, Moen, Deng		Weather:	Clear, cool			Excess Fill		CY
Date:	7-May-02		Time:	3:30			Waste	100	CY

CW2-8 Site Plan No Tunnel Creek

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North Umpqua Hydroelectric Project
FERC Project No. 1927



Possible location for
30-minute waterway
drainage pipe.

Steel
Flume

Gunite-Lined
Channel

No Tunnel Creek
A

Regrade western approach to
embankment to restore ditch on
north side of road and prevent
runoff across road surface.

Restored ditch.

GPS
Ref. ⓧ

Remove existing access
road embankment &
replace culvert (if culvert
is found to be undersized)

Six-ft deep slump failure in
downstream side of fill. Restore
through embankment
replacement (if culvert is
undersized) or by backfilling

Riprap

A

Existing 48-in
diameter culvert

Riprap

Section A
NTS

3/11/2004

Revised: 6/28/2002

CW2-8 Site Photos No Tunnel Creek

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North Umpqua Hydroelectric Project
FERC Project No. 1927



Slope failure on downslope side of access road embankment caused by drainage across road surface from upslope ditch. Embankment and culvert to be replaced.



North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

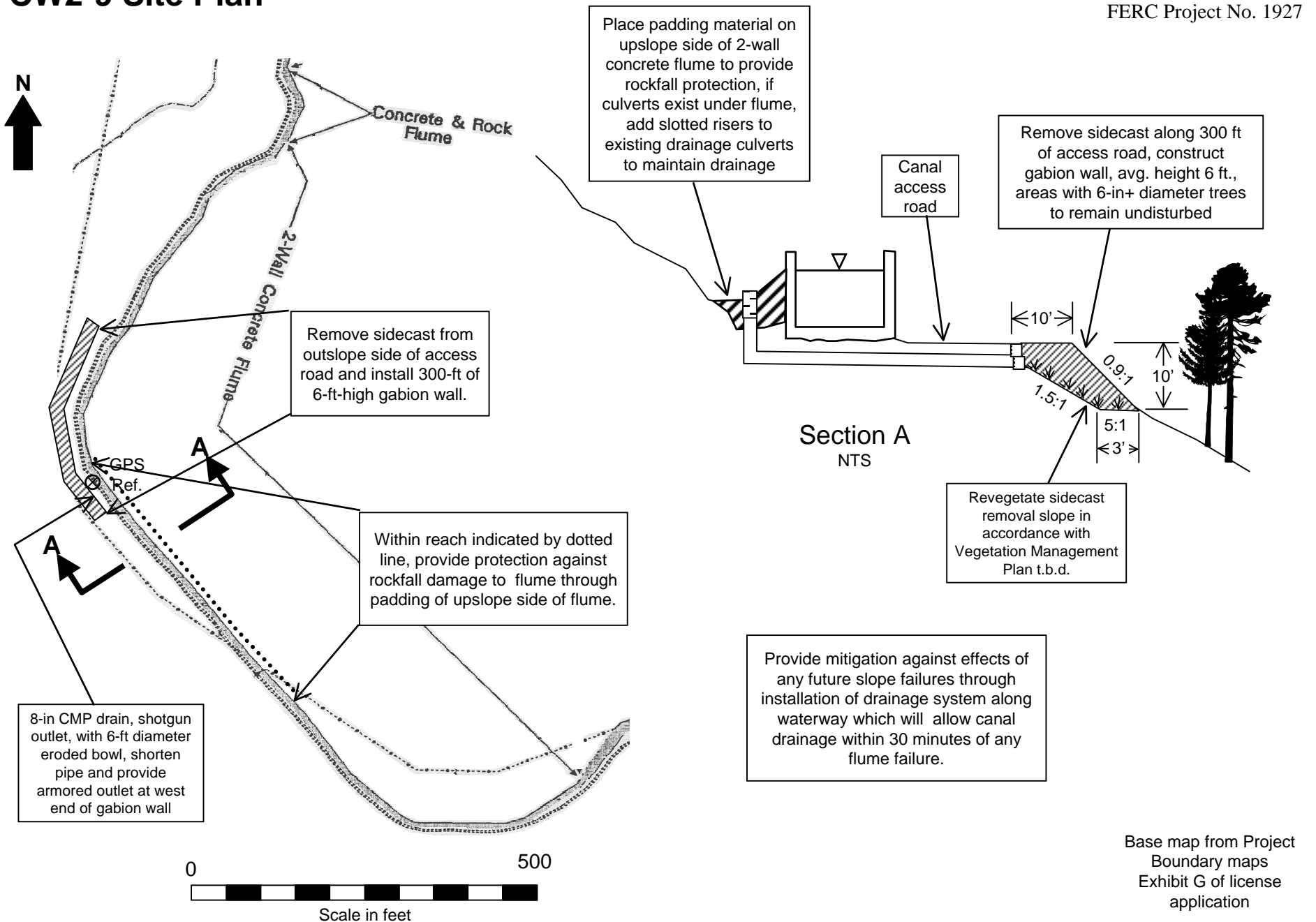
Site #	CW2-9		Priority Ranking	High	Med		Locator Info/GPS	GPS	Lat:	Long:
			Impact Rating	3	2		shows 18' accuracy.			
Project Development:		Clear Water 2	Risk Rating	2	2		Start			
Nearest Project Feature:		Waterway	Structure Type:	Double wall concrete flume.			Reference Point	43' 14.689"	122' 22.279"	
Description of Concern: Rockfall from basalt outcrops above 2-wall concrete flume could damage flume and cause leakage. Oversteepened sidecast is also present along about 60% of this segment.										
Proposed Remediation: Provide protection against rockfall damage to flume through padding of upslope sides of flume. Selectively remove sidecast from oversteepened areas, leaving 6-in diameter and larger trees. Install 300 linear ft of 6-ft high gabion wall to provide along access road. Additional mitigation against future failures provided by construction of 30-minute waterway drainage system.										
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches				
Padding of Upslope Canal Wall w/ Fill						Site contains two erosion treatments (1) Basalt cliffs above canal, and (2) Sidecast below access road (1) Priority Rating: High (4) w/ Impact (5), Risk (3) (2) Priority Rating: Medium (3) w/ Impact (3), Risk (3) Prior to construction of erosion mitigation measures, agency personnel will review draft designs as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments. Areas where ground is disturbed will be protected with jute mats or other comparable erosion control measures until vegetation planting or other ground cover is provided in accordance with the VMP.				
Clean/Locate Risers at Padding Area		8	EA							
Riser pipes 24" dia. 4' high (assumed)		8	EA							
Pipe Bedding/Wall Drainage Rock (5CY/Riser)		40	CY							
Fill Padding 500' (2CY/FT)		1,000	CY							
Sidecast Removal										
Excavation		670	CY							
Use as Padding Material (or Stockpile)		600	CY							
Waste Disposal		70	CY							
Gabion Wall, 6' x 300'										
Excavation for tie backs		530	CY							
Spread compact backfill		400	CY							
Use as Padding Material (or Stockpile)		130	CY							
Place wire mesh tie-backs		2,700	SF							
Place gabion baskets 6' high		300	LF							
Stone fill in baskets		200	CY							
(Cont. on next page)										
Data Collection Information:						Mass Bal	Borrow	270	CY	
Team:	Hansen, Moen, Deng	Weather:	Clear, cool				Excess Fill		CY	
Date:	7-May-02	Time:	4:30				Waste	70	CY	

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	CW2-9		Priority Ranking	High (4)	Med (3)		Locator Info/GPS	GPS	Lat:	Long:
	(Cont.)		Impact Rating	5	3		shows 18' accuracy.			
Project Development:	Clear Water 2		Risk Rating	3	3		Start			
Nearest Project Feature:	Waterway		Structure Type:	Double wall concrete flume.			Reference Point	43' 14.689"	122' 22.279"	
End										
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches				
(Con.)										
Slope Revegetation										
Jute Matting		24,000	SF							
Revegetation		24,000	SF							
Data Collection Information:						Mass Bal	Borrow	270	CY	
Team:	Hansen, Moen, Denq	Weather:	Clear, cool				Excess Fill		CY	
Date:	7-May-02	Time:	4:30				Waste	70	CY	

CW2-9 Site Plan

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



3/11/2004

Revised: 6/28/2002

CW2-9 Site Photo

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North Umpqua Hydroelectric Project
FERC Project No. 1927



View west along waterway
showing typical 2-wall
concrete flume structure.

Where appropriate, place padding
material on upslope side of 2-wall
concrete flume to provide rockfall
protection, add slotted risers to
existing drainage culverts to maintain
drainage from behind flume. Existing
trees to remain in place.

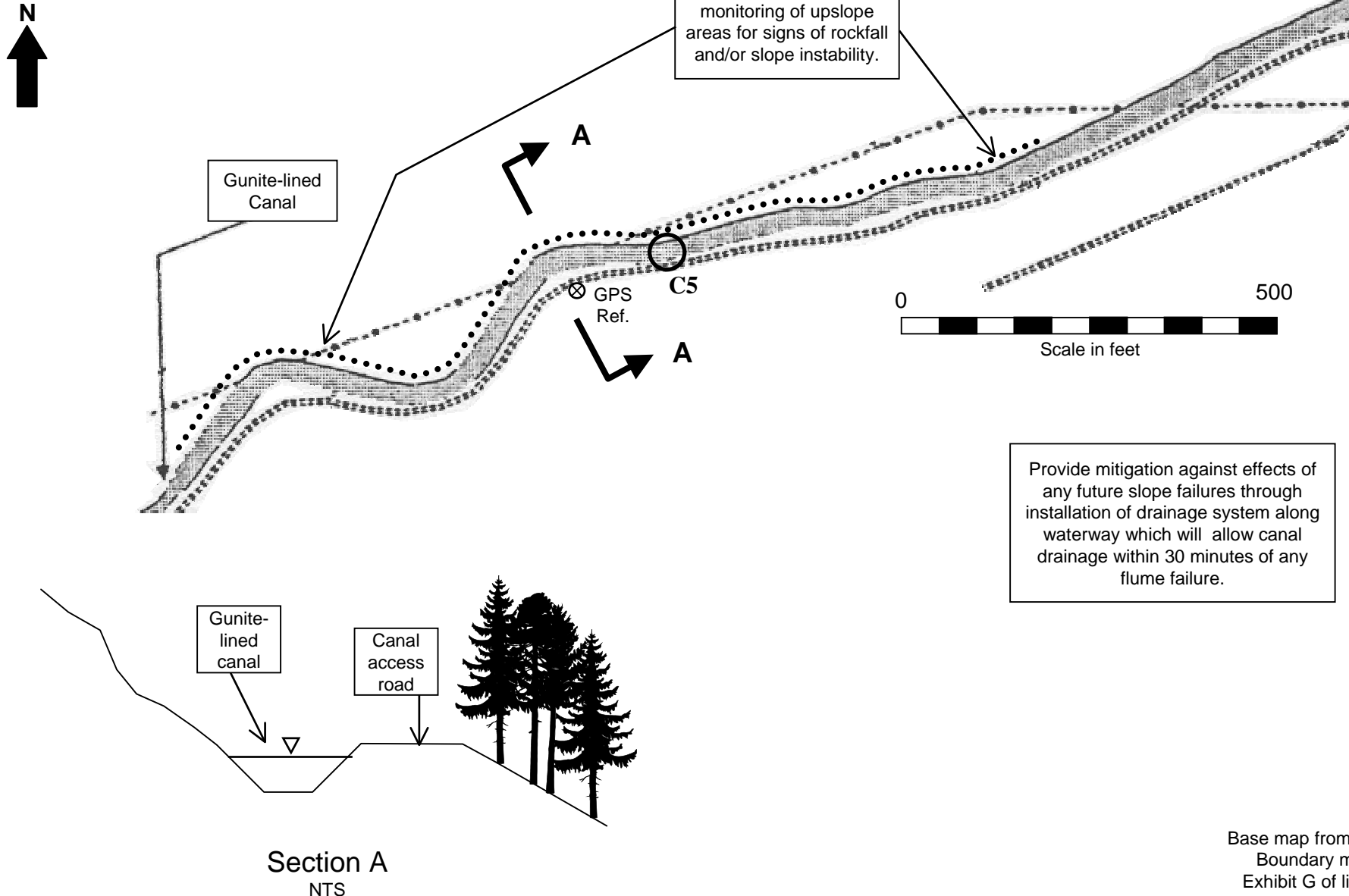
Provide mitigation against effects of
any future slope failures through
installation of drainage system along
waterway which will allow canal
drainage within 30 minutes of any
flume failure.

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	CW2-10		Priority Ranking	Med		Locator Info/GPS	GPS	Lat:	Long:
			Impact Rating	2		shows 23' accuracy.			
Project Development:	Clearwater 2		Risk Rating	2		Start			
Nearest Project Feature:	Waterway		Structure Type:	Gunite lined canal		Reference Point		43' 14.699"	122' 21.789"
Description of Concern: Discontinuous outcrops of mudflow breccia above canal 20'-40' high. Rocks rolling down slope could land in gunite-lined canal and cause partial blockage.									
Proposed Remediation: Mitigation provided through construction of 30-minute canal drainage system. Ongoing monitoring through daily and annual inspections.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
NA						Aquatic connectivity site C5 is located within this site. Issues related to future modifications planned to restore aquatic connectivity have not been taken into account in evaluating the need for additional erosion mitigation measures. Final design of aquatic connectivity measures at this site may include erosion control measures in addition to the construction of the 30-minute drainage system.			
Data Collection Information:						Mass Bal	Borrow		CY
Team:	Hansen, Moen, Deng	Weather:	Clear, cool				Excess Fill		CY
Date:	7-May-02	Time:	5:10				Waste		CY

CW2-10 Site Plan

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



3/11/2004

Revised: 6/28/2002

CW2-10 Site Photo

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North Umpqua Hydroelectric Project
FERC Project No. 1927



View east along waterway
showing typical gunitelined canal.

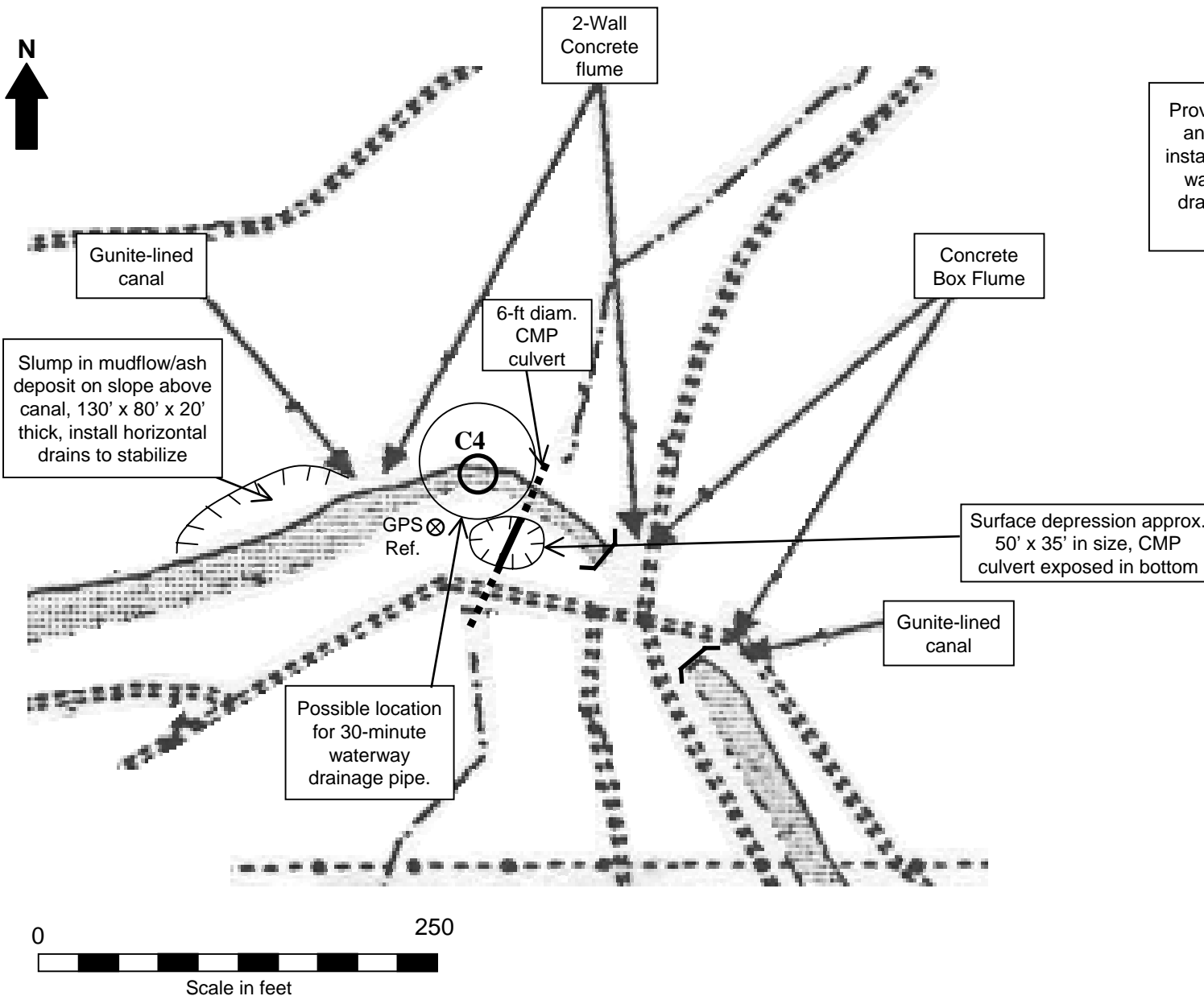
Provide mitigation against effects of any future slope failures through installation of drainage system along waterway which will allow canal drainage within 30 minutes of any flume failure. Field work during spring 2002 to verify need for additional mitigation beyond that provided by 30-minute drainage system.

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	CW2-11		Priority Ranking	Med		Locator Info/GPS	GPS	Lat:	Long:
			Impact Rating	2		shows 19' accuracy.			
Project Development:	Clearwater 2		Risk Rating	2		Start			
Nearest Project Feature:	Waterway		Structure Type:	Gunite lined canal		Reference Point		43' 14.783"	122' 21.626"
Description of Concern: Slump in mudflow/ash deposit on slope above canal, 130' x 80' x 20' thick.									
Proposed Remediation: Install horizontal drains to reduce potential or further creep deformation. Additional mitigation provided by installation of 30-minute drainage system.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
Install Horizontal Drain Pipes						<p>Proposed location for 30-minute waterway drainage pipe lies within this site. Additional engineering investigations and designs to be completed for drainage pipes. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments.</p> <p>Aquatic connectivity site C4 is located within this site. Issues related to future modifications planned to restore aquatic connectivity have not been taken into account in evaluating the need for erosion mitigation measures. Final design of aquatic connectivity measures at this site may include erosion control measures in addition to those proposed.</p> <p>Areas where ground is disturbed will be protected with jute mats or other comparable erosion control measures until vegetation planting or other ground cover is provided in accordance with the VMP.</p>			
50' Drain Pipes at 20' spacing		7	EA						
Data Collection Information:						Mass Bal	Borrow		CY
Team:	Hansen, Moen, Deng	Weather:	Clear, cool				Excess Fill		CY
Date:	7-May-02	Time:	5:15				Waste		CY

CW2-11 Site Plan

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



Provide mitigation against effects of any future slope failures through installation of drainage system along waterway which will allow canal drainage within 30 minutes of any flume failure.

Base map from Project
Boundary maps
Exhibit G of license
application

3/11/2004

Revised: 6/28/2002

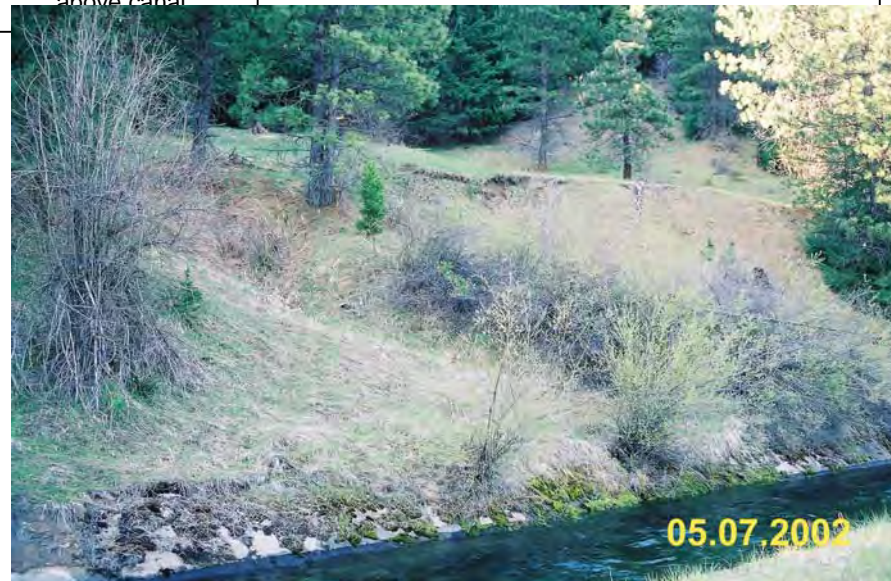
CW2-11 Site Photos

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North Umpqua Hydroelectric Project
FERC Project No. 1927



Slump in mudflow/ash
deposit on slope
above canal

Install horizontal drains to stabilize slope in area showing signs of creep deformation. Provide additional mitigation against effects of any future slope failures through installation of drainage system along waterway which will allow canal drainage within 30 minutes of any flume failure. Nearest drainage pipe will be approximately 100 ft upstream of site where horizontal drains to be installed.



CW2-11 Site Photos

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927

Surface Depression
approx. 50'x35' in size



Exposed Culvert at
bottom of depression

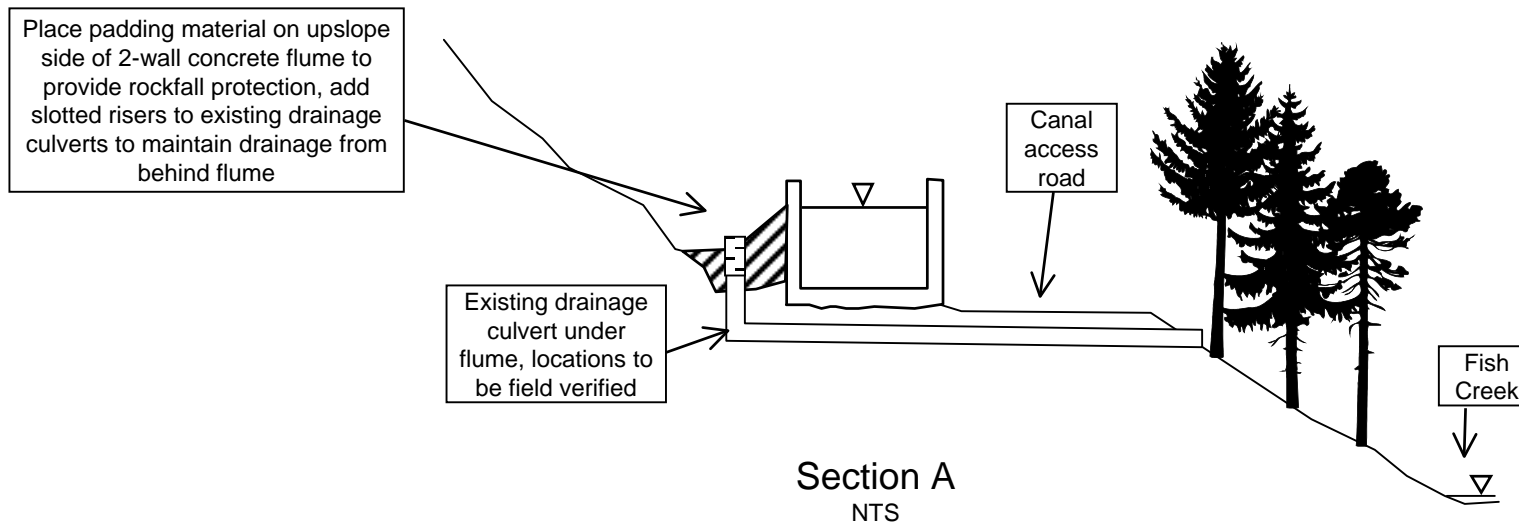
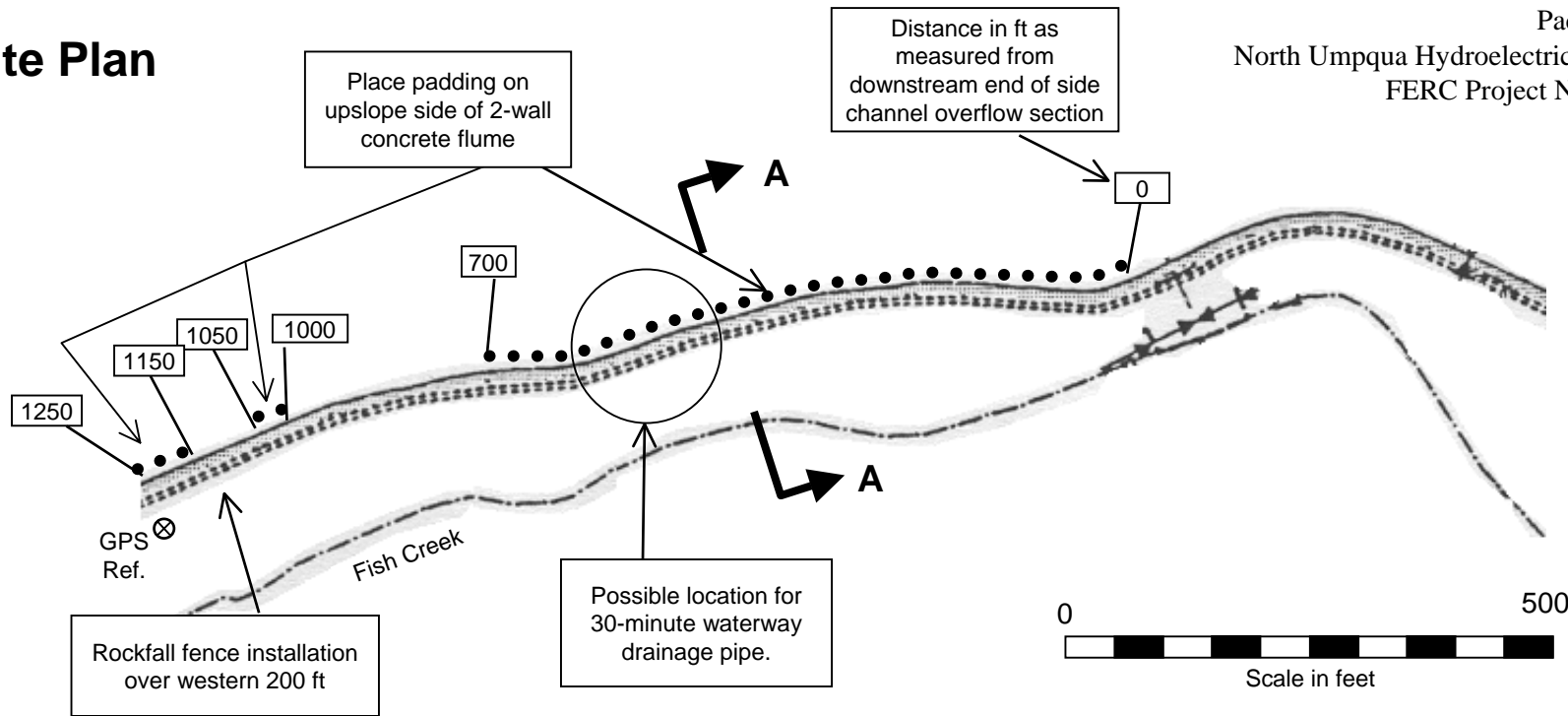


North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site # FC-1		Priority Ranking	Med		Locator Info/GPS		
		Impact Rating	2		GPS shows 37' accuracy	Lat:	Long:
Project Development:	Fish Creek	Risk Rating	2		Start		
Nearest Project Feature:	Waterway	Structure Type:	Double wall concrete flume.		Reference Point		
Description of Concern: Ash on upslope area overlain by basalt with adverse joint orientation, boulders could impact flume.					End	43' 18.840"	122' 26.036"
Proposed Remediation: Provide protection against rockfall damage to flume through padding of upslope sides of flume. Add vertical risers to six existing 24-in culverts that pass water from behind the flume.							
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches	
Padding of Upslope Canal Wall w/ Fill						Additional engineering investigations and designs to be completed for drainage pipes. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments.	
Clean/Locate Risers at Padding Area		6	EA				
Riser pipes 24" dia. 4' high (assumed)		6	EA				
Pipe Bedding/Wall Drainage Rock (5CY/Riser)		30	CY				
Fill Padding 850' (2CY/FT)		1,700	CY				
Rockfall Fence							
Rockfall Fence 200' Long X 60' High		12,000	SF				
Fence Anchors (2 Anchor per 10' Length)		41	EA				
Data Collection Information:						Mass Bal	
Team:	Hansen, Moen, Denq	Weather:	Clear, cool			Borrow	1,700 CY
Date:	6-May-02	Time:	3:15			Excess Fill	CY
						Waste	CY

FC-1 Site Plan

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



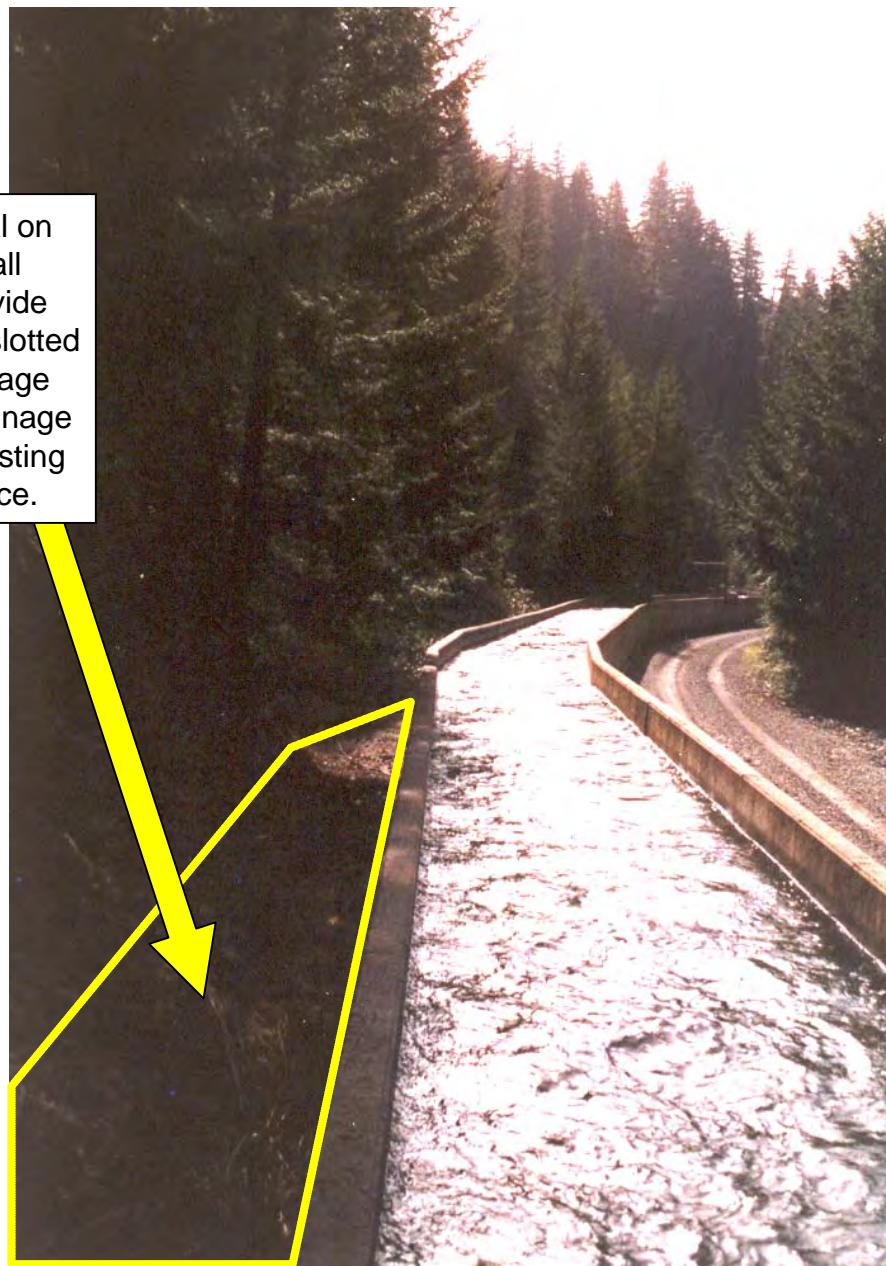
Base map from Project
Boundary maps
Exhibit G of license
application

FC-1 Site Photo

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FERC Project No. 1927

Place padding material on upslope side of 2-wall concrete flume to provide rockfall protection, add slotted risers to existing drainage culverts to maintain drainage from behind flume. Existing trees to remain in place.

Area shown in photo is for sample only – see site map for start and end points of padding placement.

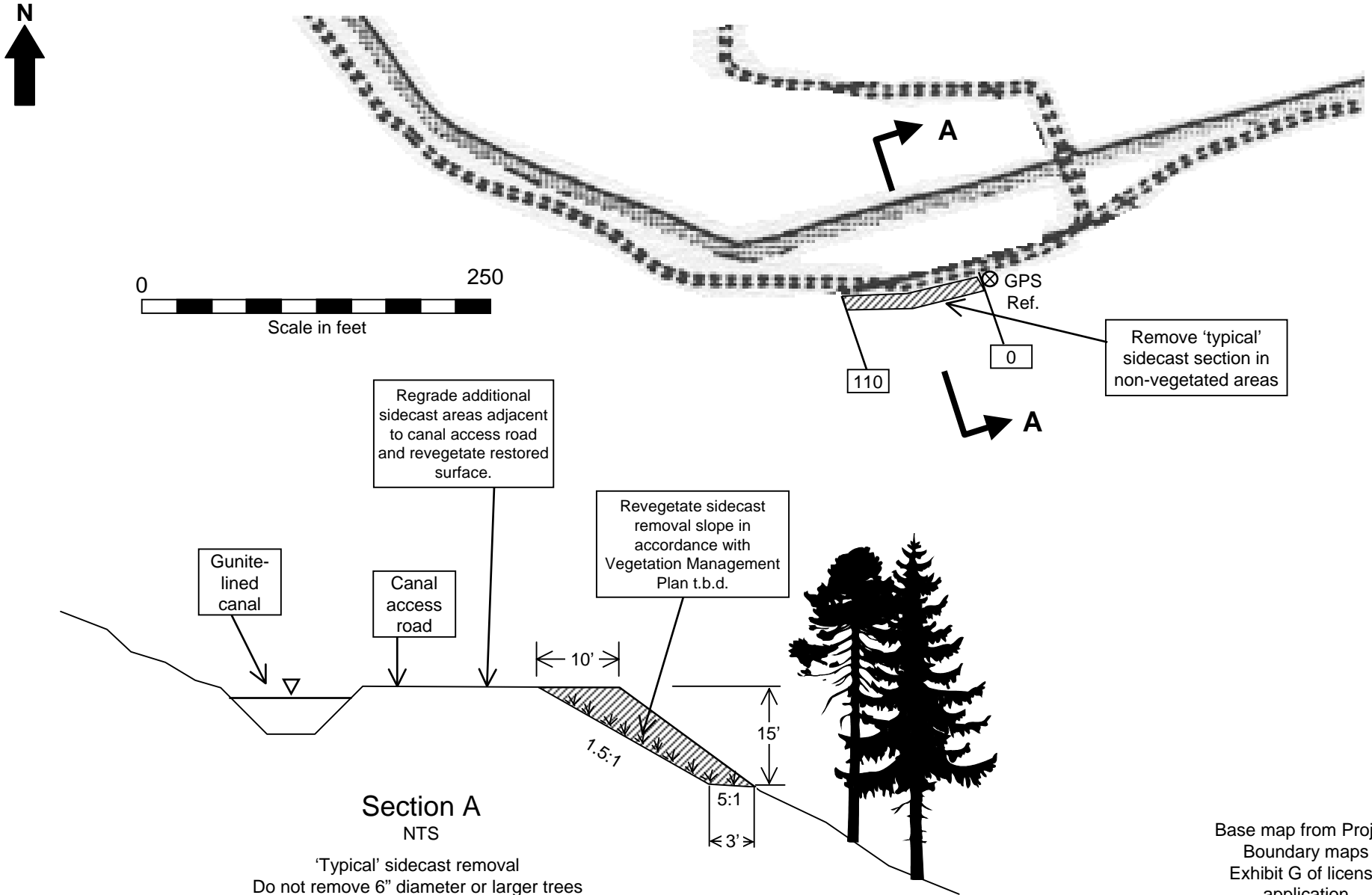


Site Remediation/ Assessment Form

Revised: 3/4/2004

FC-2 Site Plan

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



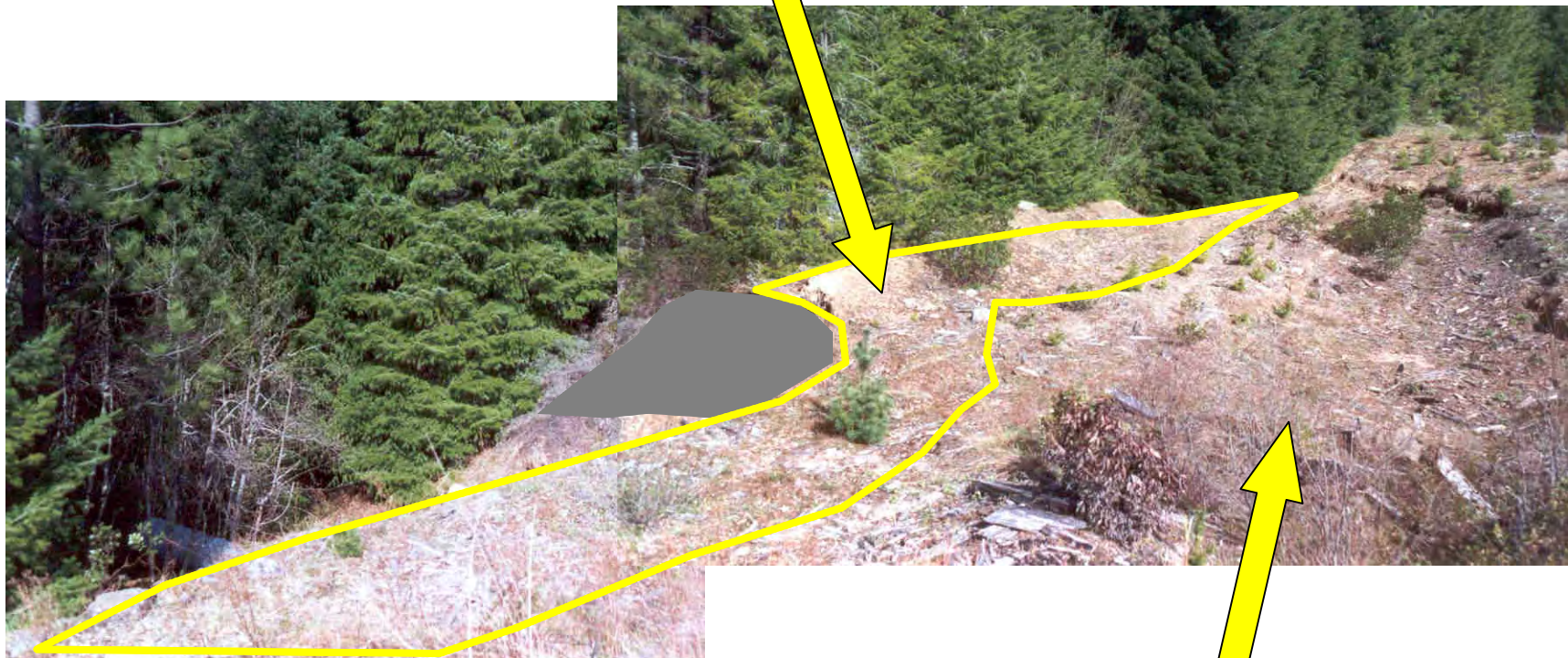
3/11/2004

Revised: 6/28/2002

FC-2 Site Photo

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927

Remove 'typical' sidecast
section in non-vegetated
areas, do not remove trees
greater than 6" in diameter



View is looking west
along south side of
canal access road

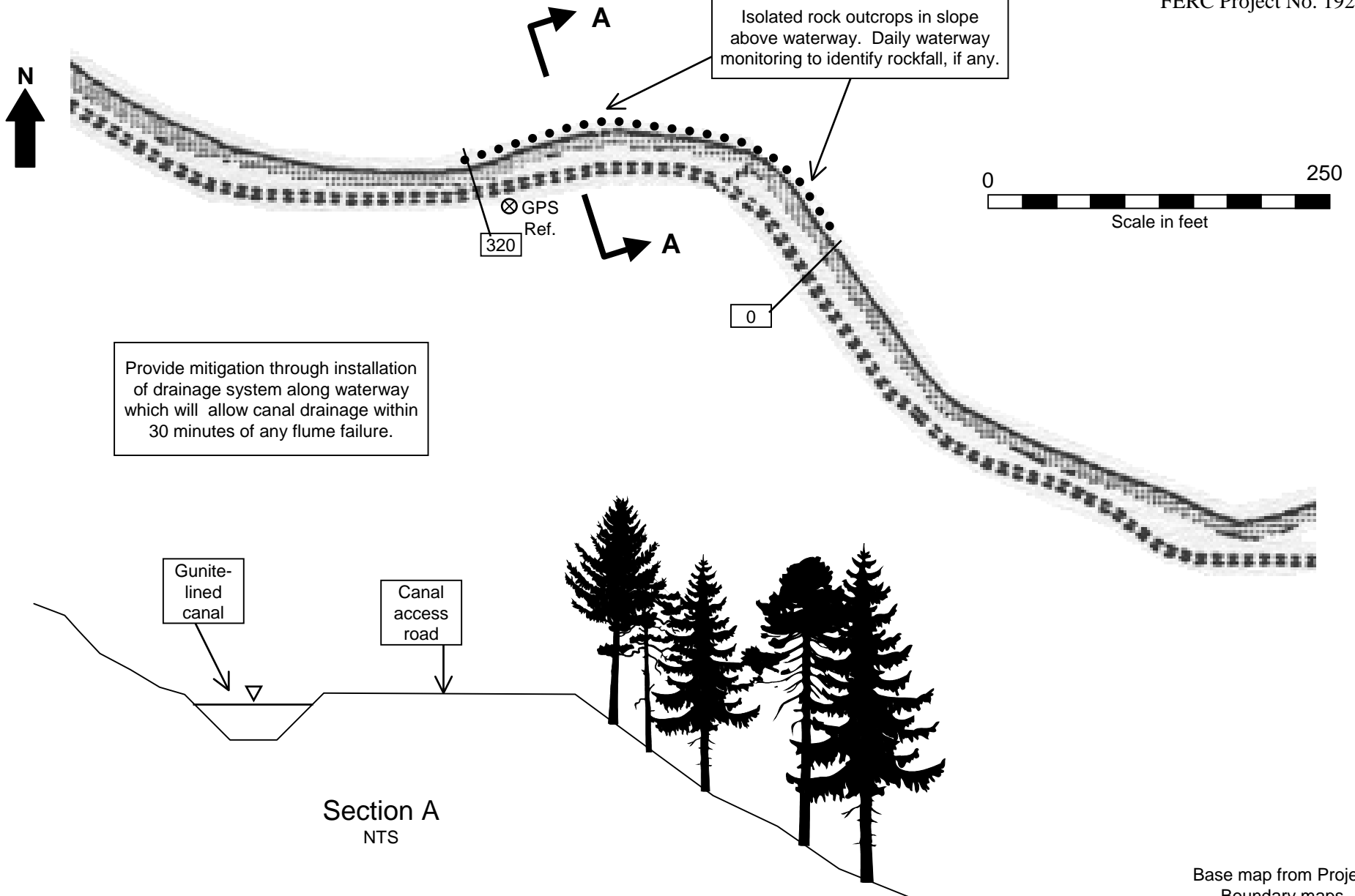
Regrade additional sidecast
areas adjacent to canal
access road and revegetate
restored surface.

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site # FC-3		Priority Ranking	Med		Locator Info/GPS	GPS	Lat:	Long:
		Impact Rating	2		shows 16' accuracy			
Project Development:	Fish Creek	Risk Rating	2		Start			
Nearest Project Feature:	Waterway	Structure Type:	Gunite-lined canal		Reference Point	43' 12.973"	122' 26.258"	
Description of Concern: Potential rockfall which could plug waterway.								
Proposed Remediation: Thirty minute canal drainage system will mitigate against rockfall/slope failure. Daily canal inspections will identify any rockfall.								
Remediation Task Breakdown:	Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
					Consider rock scaling at this site. Evaluate during annual monitoring.			
NA								
Data Collection Information:					Mass Bal	Borrow		CY
Team:	Hansen, Moen, Denq	Weather:	Clear, cool			Excess Fill		CY
Date:	6-May-02	Time:	3:45			Waste		CY

FC-3 Site Plan

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



Base map from Project
Boundary maps
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application

3/11/2004

Revised: 6/28/2002

FC-3 Site Photo

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927

Typical slope on north side of gunite-lined canal. Provide mitigation through installation of drainage system along waterway which will allow canal drainage within 30 minutes.

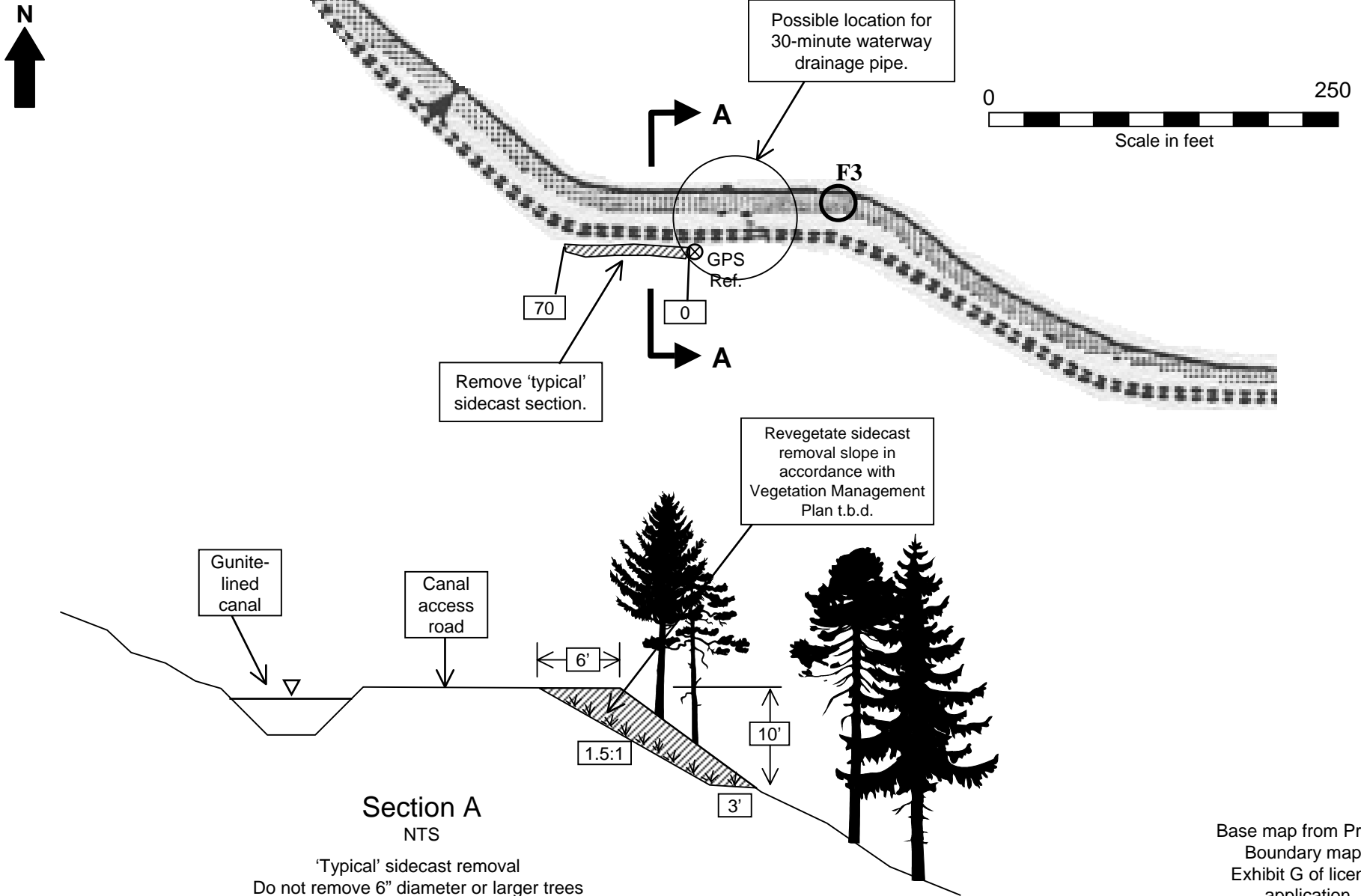


North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site # FC-5		Priority Ranking	Med		Locator Info/GPS	GPS	Lat:	Long:
		Impact Rating	2		shows 17' accuracy		43' 13.052"	122' 26.373"
Project Development:	Fish Creek	Risk Rating	2		Start			
Nearest Project Feature:	Waterway	Structure Type:	Gunite-lined canal		Reference Point			
Description of Concern: Spoil/sidecast below road.								
Proposed Remediation: Selectively remove sidecast. Do not remove any established trees. See sketch map.								
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches		
Sidecast Removal						Aquatic connectivity site F3 lies immediately east of this site. Issues related to future modifications planned to restore aquatic connectivity at this site have not been taken into account in developing proposed erosion mitigation measures at this site. Final design of aquatic connectivity measures at this site may result in modifications to the dimensions and limits of erosion treatments shown.		
Excavation		210	CY					
Use as Padding Material (or Stockpile)		190	CY					
Waste disposal		20	CY					
Slope Revegetation								
Jute Matting		1,500	SF			Additional engineering investigations and designs to be completed for drainage pipes. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments.		
Revegetation		1,500	SF					
						Areas where sidecast is removed will be protected with jute mats or other comparable erosion control measures until vegetation planting or other ground cover is provided in accordance with the VMP. Leave 6" and larger diameter trees and their roots		
Data Collection Information:						Mass Bal	Borrow	CY
Team:	Hansen, Moen, Denq	Weather:	Clear, cool				Excess Fill	190 CY
Date:	6-May-02	Time:	4:00				Waste	20 CY

FC-5 Site Plan

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



Base map from Project
Boundary maps
Exhibit G of license
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3/11/2004

Revised: 6/28/2002

FC-5 Site Photo

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



View is looking east
along downslope side
of canal access road.

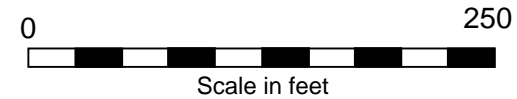
Typical area with
sidecast to be
removed and
revegetated.

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site # FC-6		Priority Ranking	High		Locator Info/GPS	GPS		
		Impact Rating	3		shows 43' accuracy		Lat:	Long:
Project Development:	Fish Creek	Risk Rating	3		Start			
Nearest Project Feature:	Waterway	Structure Type:	Gunite-lined canal		Reference Point		43' 13.108"	122' 26.390"
Description of Concern: Active earthflow in 1980s failed canal, spoil pile/sidecast washed out by spill, eroded area has 30' vertical pumice banks that will continue to slump and deliver sediment to creek. Site appears to be stabilized by drains and rock buttress installed following failure.								
Proposed Remediation: Recontour sides of failed slopes, place rock to buttress slopes, revegetate disturbed areas.								
Remediation Task Breakdown:	Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
					Additional engineering investigations and designs to be completed prior to construction. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments.			
Regrade Site								
Tree Removal	20	EA						
Waste Disposal	200	CY						
Bulldozer & Excavator site regrading	8	HR						
Rockfill slope buttress	830	CY						
Slope Revegetation								
Jute Matting	12,000	SF						
Revegetation	12,000	SF						
					Areas where the slope is recontoured will be protected with jute mats or other comparable erosion control measures until vegetation planting or other ground cover is provided in accordance with the VMP.			
Data Collection Information:					Mass Bal	Borrow	830	CY
Team:	Hansen, Moen, Denq	Weather:	Clear, cool			Excess Fill		CY
Date:	6-May-02	Time:	4:15			Waste	200	CY

FC-6 Site Plan

PacifiCorp
pqua Hydroelectric Project
FERC Project No. 1927



Fish Creek

GPS
Ref.

Earthflow, additional
geotechnical study maybe
required to define affected
area if future movement
impacts canal alignment

Possible location for
30-minute waterway
drainage pipe.

Failed area in pumice slope,
up to 65 ft wide and 30 ft
deep, vegetated along sides,
recontour sides of failure area,
place rock to buttress slope

Earthflow
area

Gunite-lined
canal with
membrane liner

Canal
access
road

Trees along
sides of failure
area to remain

Additional mitigation to be
provided through
construction of waterway
drainage system.

Section A
NTS

170'

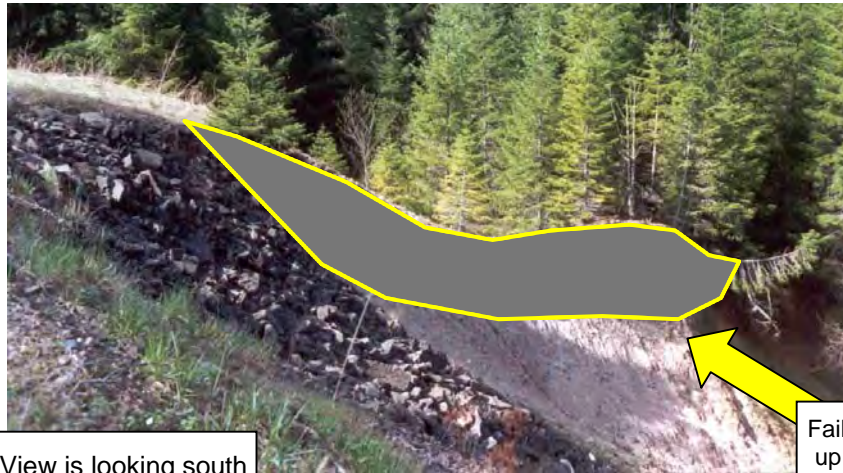
120'

Fish
Creek

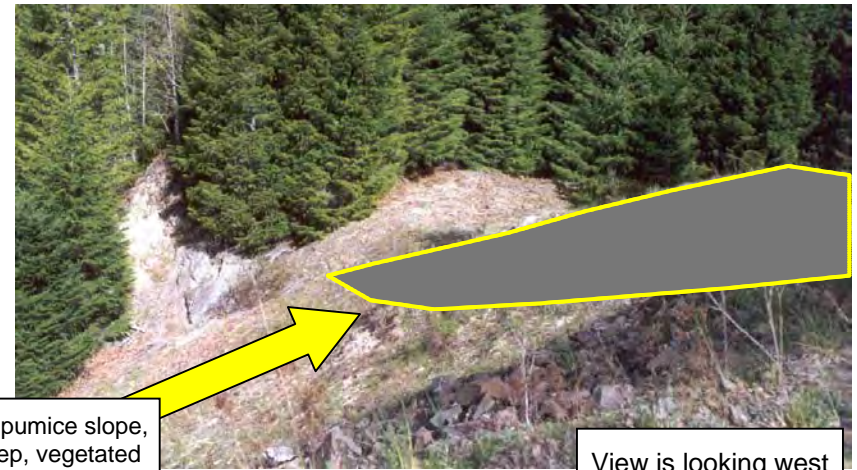
Base map from Project
Boundary maps
Exhibit G of license
application

FC-6 Site Photos

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



View is looking south
at southern side of
failure area



Failed area in pumice slope,
up to 30 ft deep, vegetated
along sides, recontour sides
of failure area, place rock to
buttress slope

View is looking west
along south side of
canal access road



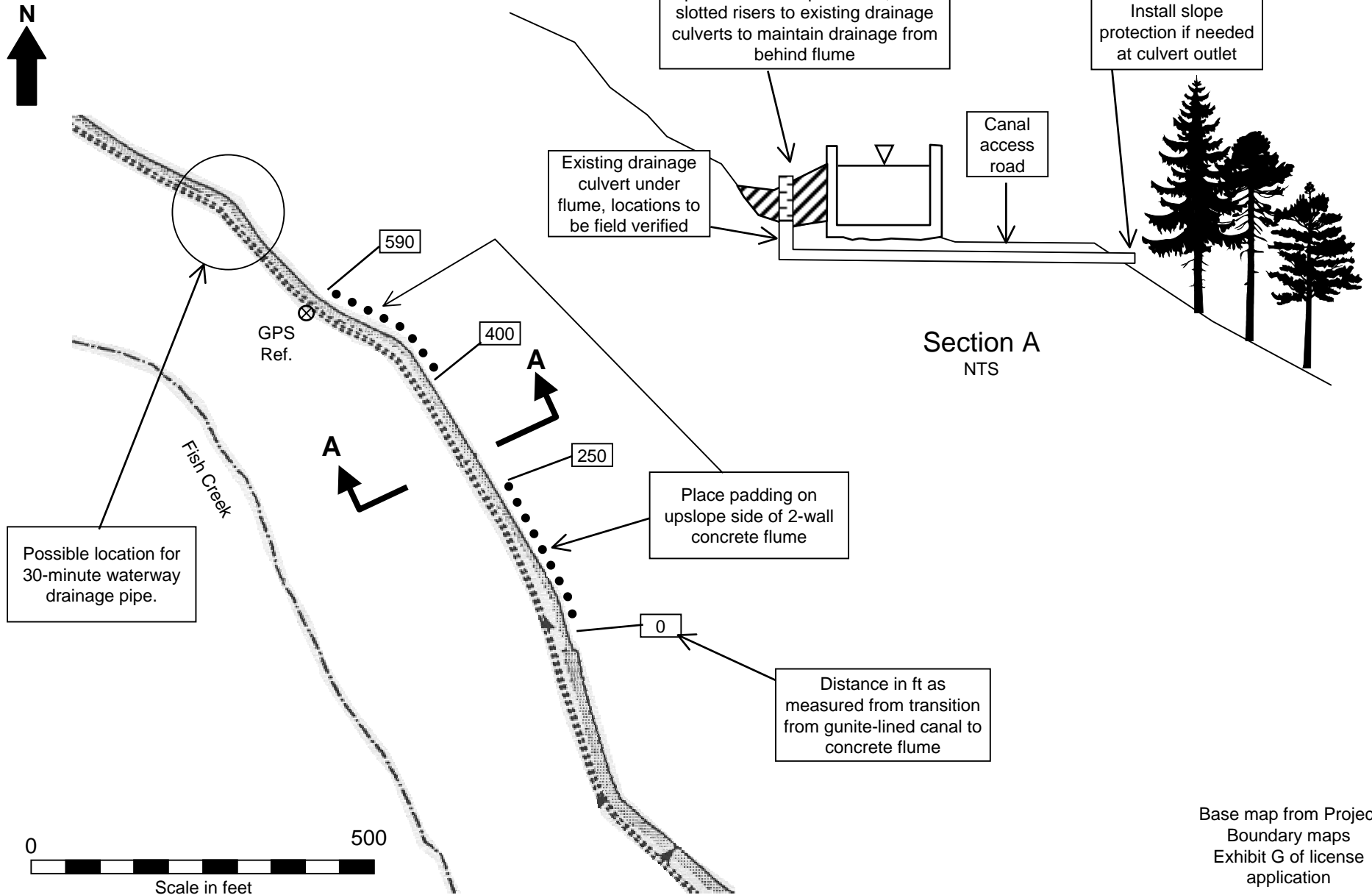
View northeast
across gunite-
lined canal

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site # FC-7		Priority Ranking	Med	Med		Locator Info/GPS	GPS		
		Impact Rating	2	2		shows 143' accuracy	Lat:	Long:	
Project Development:	Fish Creek	Risk Rating	2	2		Start			
Nearest Project Feature:	Waterway	Structure Type:	Double wall concrete flume.			Reference Point			
Description of Concern: Rocks rolling down slope above waterway could potentially impact wall of gunite-lined canal. Spoil piles/sidecast are also present in areas below the access road, though most are well vegetated.						End	43' 13.279	122' 26.391	
Proposed Remediation: Provide protection against rockfall damage to flume through padding of upslope sides of flume. Sidecast below access road to remain in place unless future monitoring shows signs of movement/failure.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
Padding of Upslope Canal Wall w/ Fill						Additional engineering investigations and designs to be completed for drainage pipes. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process. Final designs may result in modifications to the dimensions and limits of the proposed treatments.			
Clean/Locate Risers at Padding Area		5	EA						
Riser pipes 24" dia. 4' high (assumed)		5	EA						
Pipe Bedding/Wall Drainage Rock (5CY/Riser)		25	CY						
Fill Padding 440' (2CY/FT)		880	CY						
Data Collection Information:						Mass Bal	Borrow	880	CY
Team:	Hansen, Moen, Denq	Weather:	Clear, cool				Excess Fill		CY
Date:	6-May-02	Time:	4:30				Waste		CY

FC-7 Site Plan

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



3/11/2004

Revised: 6/28/2002

FC-7 Site Photo

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927

Place padding material on upslope side of 2-wall concrete flume to provide rockfall protection, add slotted risers to existing drainage culverts to maintain drainage from behind flume. Existing trees to remain in place.



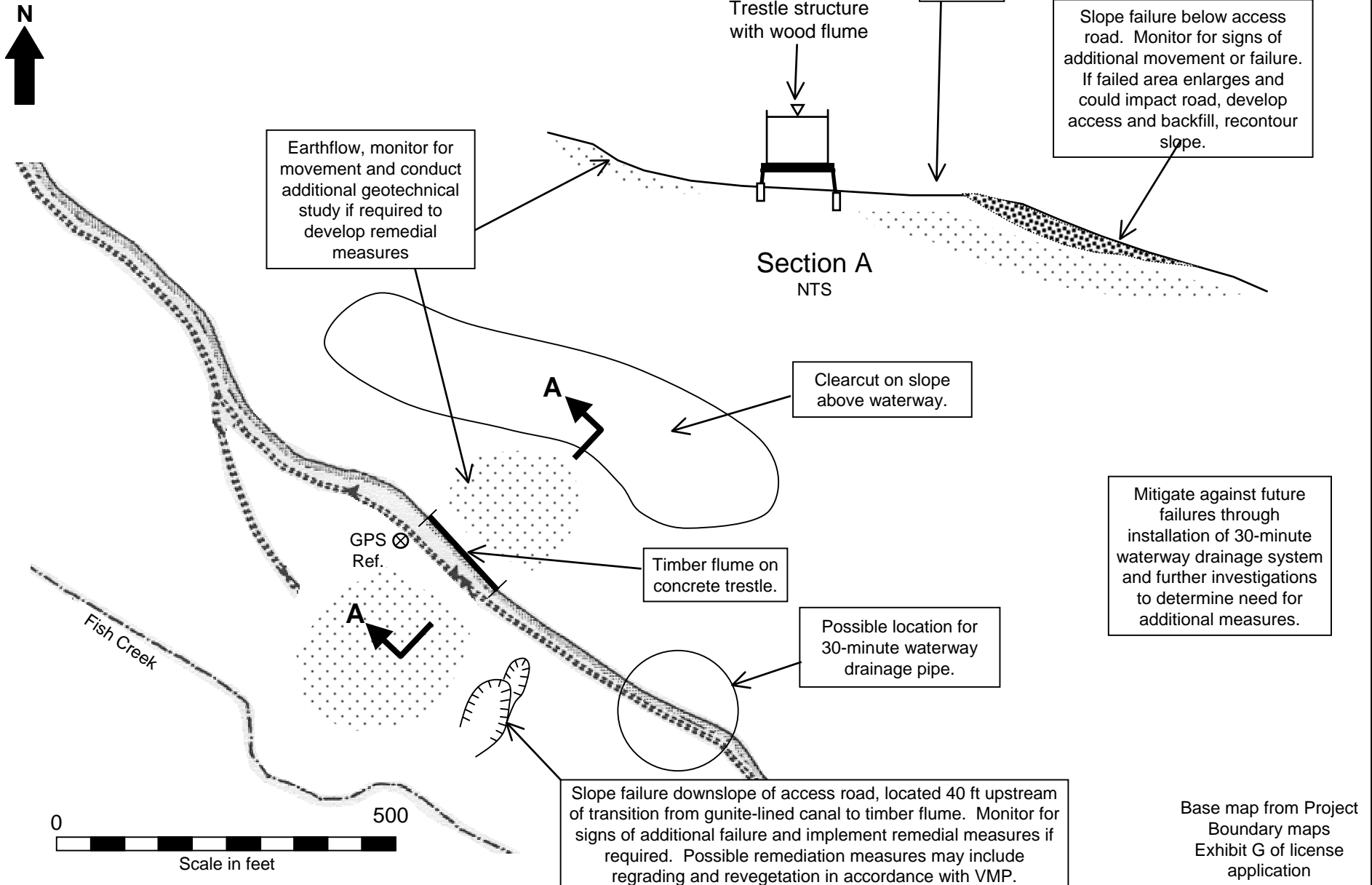
View is looking east
along south side of
canal access road.

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	FC-8		Priority Ranking	High		Locator Info/GPS	GPS shows		
			Impact Rating	3		19' accuracy	Lat:	Long:	
Project Development:		Fish Creek	Risk Rating	3		Start			
Nearest Project Feature:		Waterway	Structure Type:	Double wall conc. flume & trestle.		Reference Point	43' 13.377"	122' 26.425"	
Description of Concern:		Active earthflow beneath waterway, which is in wood flume, slump rotational feature below road. Slump below road thought to have been activated/enhanced by seepage beneath canal when upslope side of concrete flume upstream was punctured by boulder impact, evidence of multiple past failures.							
Proposed Remediation: Mitigate against future failures through installation of 30-minute waterway drainage system. Monitor slopes above and below canal for signs of deformation/failure. If further deformation is indicated, implement additional remedial measures such as recontouring of slope, installation of drains, etc. Remediation may also be required below the access road if the existing slump failure enlarges and impacts the access road.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
NA						Potential location for 30-minute waterway drainage pipe approximately 200-300 feet upstream of this site. Additional engineering investigations and designs to be completed for drainage pipes. Design efforts will include review of draft designs by agency personnel as part of the normal implementation process.			
						PacifiCorp will attempt to locate geotechnical information from past investigations at this site. New investigations will be conducted if needed, and may include borings, sampling, laboratory testing, etc. A final plan for mitigation measures at this site will be developed by 2005.			
Data Collection Information:						Mass Bal	Borrow		CY
Team:	Hansen, Moen, Denq	Weather:	Clear, cool				Excess Fill		CY
Date:	6-May-02	Time:	4:45				Waste		CY

FC-8 Site Plan

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



3/11/2004

Revised: 11/11/03

FC-8 Site Photos

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



View looking west
across area underlain
by earthflow



Failed area in slope below
access road. Monitor for
signs of additional movement.
If movement/failure occurs,
develop access and
implement remedial
measures.

North Umpqua Hydroelectric Project (FERC 1927)

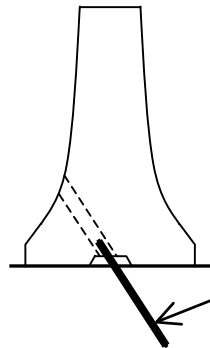
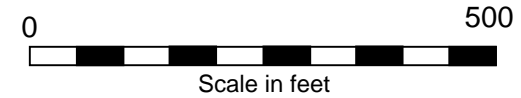
Erosion Control Plan

Site Remediation/ Assessment Form

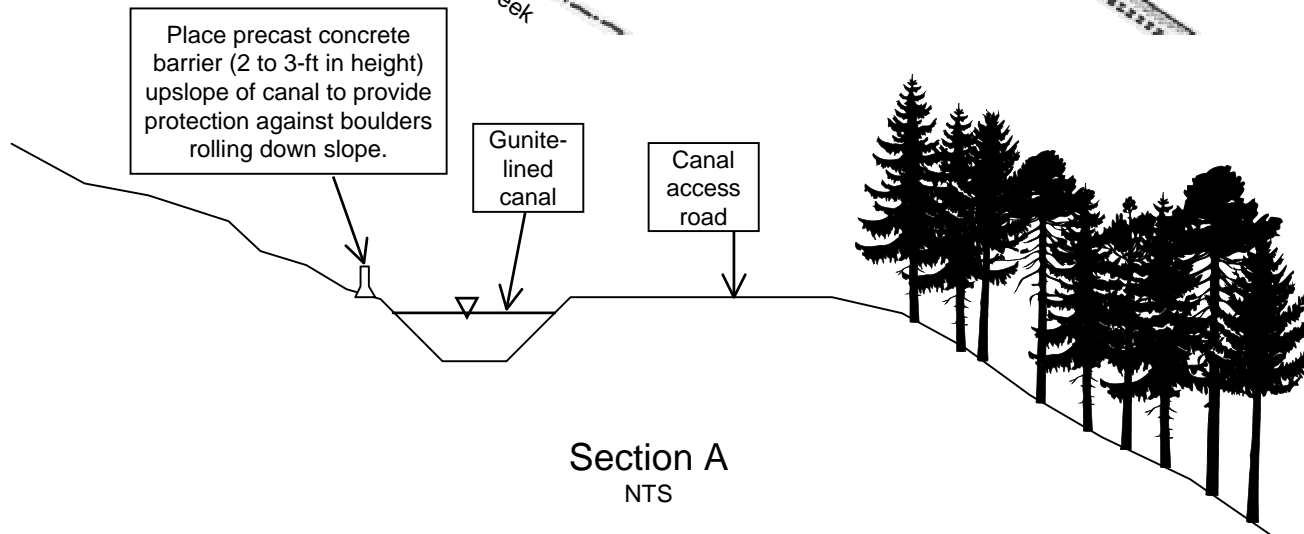
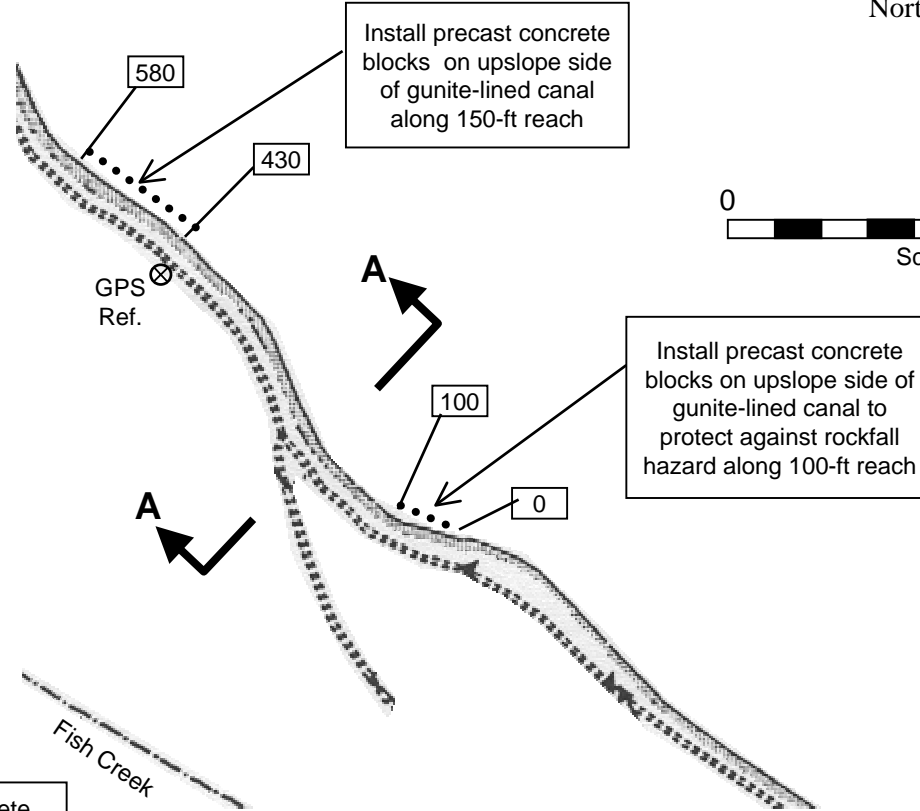
Site # FC-9		Priority Ranking	Med	Med		Locator Info/GPS	GPS shows		
		Impact Rating	2	2		30' accuracy	Lat:	Long:	
Project Development:	Fish Creek	Risk Rating	2	2		Start			
Nearest Project Feature:	Waterway	Structure Type:	Gunite-lined canal			Reference Point	43' 13.432"	122' 26.463"	
Description of Concern: Rocks rolling down from slope above canal could potentially damage wall of gunite-lined canal. Sidecast is also present below the access road, but is heavily vegetated through this section.									
Proposed Remediation: Provide protection against rockfall damage to flume through placement of concrete blocks immediately upslope of canal. Sidecast to remain in place unless future monitoring indicates that movement is occurring.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
Precast Concrete Placement						Concrete barrier would be constructed of precast concrete blocks typically used in road construction, referred to as "Jersey" barriers or equivalent. Site preparation limited to creation of a bench on the upslope side of the waterway that would be wide enough to accommodate the base of a precast block segment.			
Prepare Berm for Concrete Barrier 250' long		250	LF						
Typ. Precast Highway Concrete Barrier 12.5'L x 2.7'H		20	EA						
Data Collection Information:						Mass Bal	Borrow		CY
Team:	Hansen, Moen, Denq	Weather:	Clear, cool				Excess Fill		CY
Date:	6-May-02	Time:	5:00				Waste		CY

FC-9 Site Plan

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



Typical Concrete Barrier
NTS



Base map from Project
Boundary maps
Exhibit G of license
application

FC-9 Site Photo

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



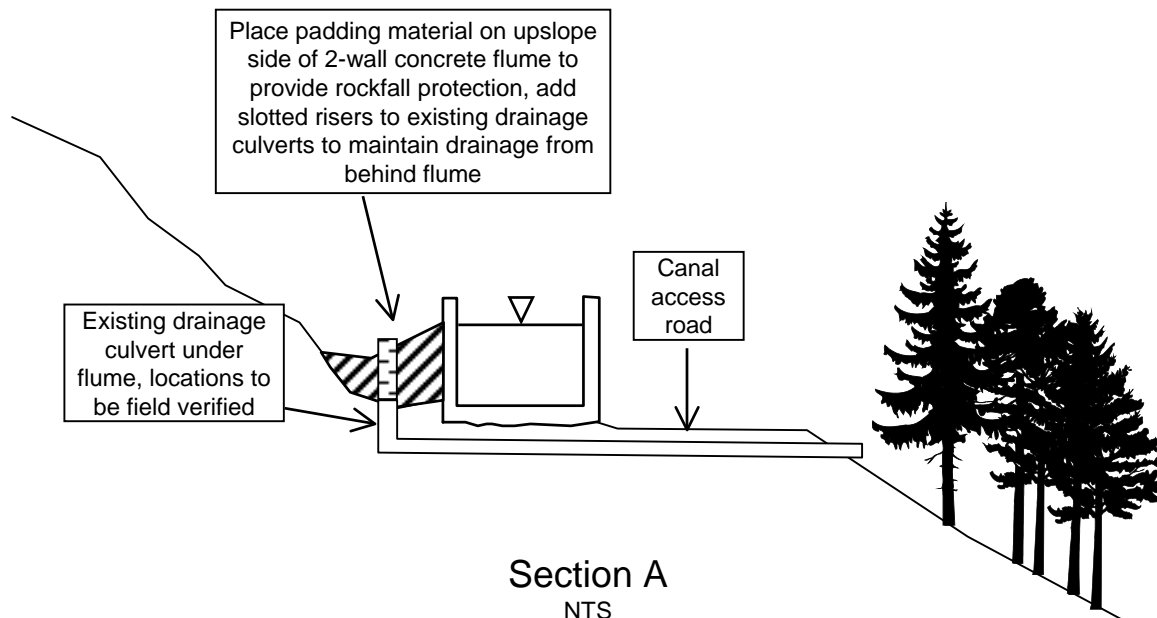
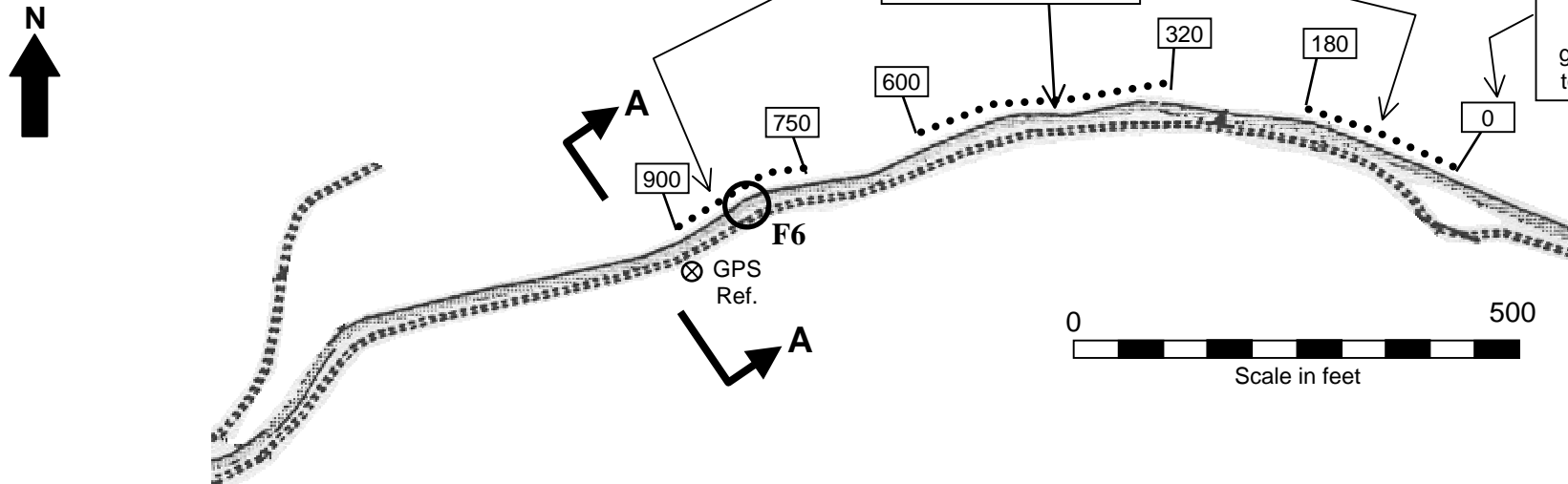
Photo looking east along typical gunite-lined canal. Mitigation measures to be installed on upslope side of canal to protect against rockfall hazard in two reaches totaling approximately 250 feet.

North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/ Assessment Form

Site #	FC-10		Priority Ranking	Med		Locator Info/GPS	GPS		
			Impact Rating	2		shows 20' accuracy		Lat:	Long:
Project Development:	Fish Creek		Risk Rating	2		Start			
Nearest Project Feature:	Waterway		Structure Type:	Double wall concrete flume.		Reference Point			
Description of Concern:	Rockfall from slopes above canal could potentially impact canal wall and cause leakage. Heavily vegetated sidecast present along portions of the access road.								
Proposed Remediation: Provide protection against rockfall damage to flume through padding of upslope sides of flume. Sidecast to remain in place unless future monitoring shows signs of movement/failure.									
Remediation Task Breakdown:	Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches				
					Aquatic connectivity site F6 located at the western end of this site. Issues related to future modifications planned to restore aquatic connectivity at this site have not been taken into account in developing proposed erosion mitigation measures at this site. Final design of aquatic connectivity measures at this site may result in modifications to the dimensions and limits of erosion treatments shown.				
Padding of Upslope Canal Wall w/ Fill									
Clean/Locate Risers at Padding Area	6	EA							
Riser pipes 24" dia. 4' high (assumed)	6	EA							
Pipe Bedding/Wall Drainage Rock (5CY/Riser)	30	CY							
Fill Padding 610' (2CY/FT)	1,200	CY							
					Sidecast vegetated, no immediate removal necessary. Monitor and remove if later found necessary.				
Data Collection Information:					Mass Bal	Borrow	1,200	CY	
Team:	Hansen, Moen, Denq		Weather:	Clear, cool		Excess Fill		CY	
Date:	6-May-02		Time:	5:30		Waste		CY	

FC-10 Site Plan

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



Base map from Project
Boundary maps
Exhibit G of license
application

FC-10 Site Photo

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



View looking north across 2-wall concrete flume showing typical upslope conditions. Place padding material on upslope side of concrete flume to provide rockfall protection, add slotted risers to existing drainage culverts to maintain drainage from behind flume

Site Remediation/ Assessment Form

Revised: 3/4/2004

SC1 Site Plan Slide Creek Diversion Dam

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



Bank erosion along edge of spillway channel has removed material from bank and caused failure of access road surface. Access to dam still available from upstream side. Material exposed on bank is largely bedrock and little additional erosion is likely to occur. Restoration only needed if improved access is needed to dam.

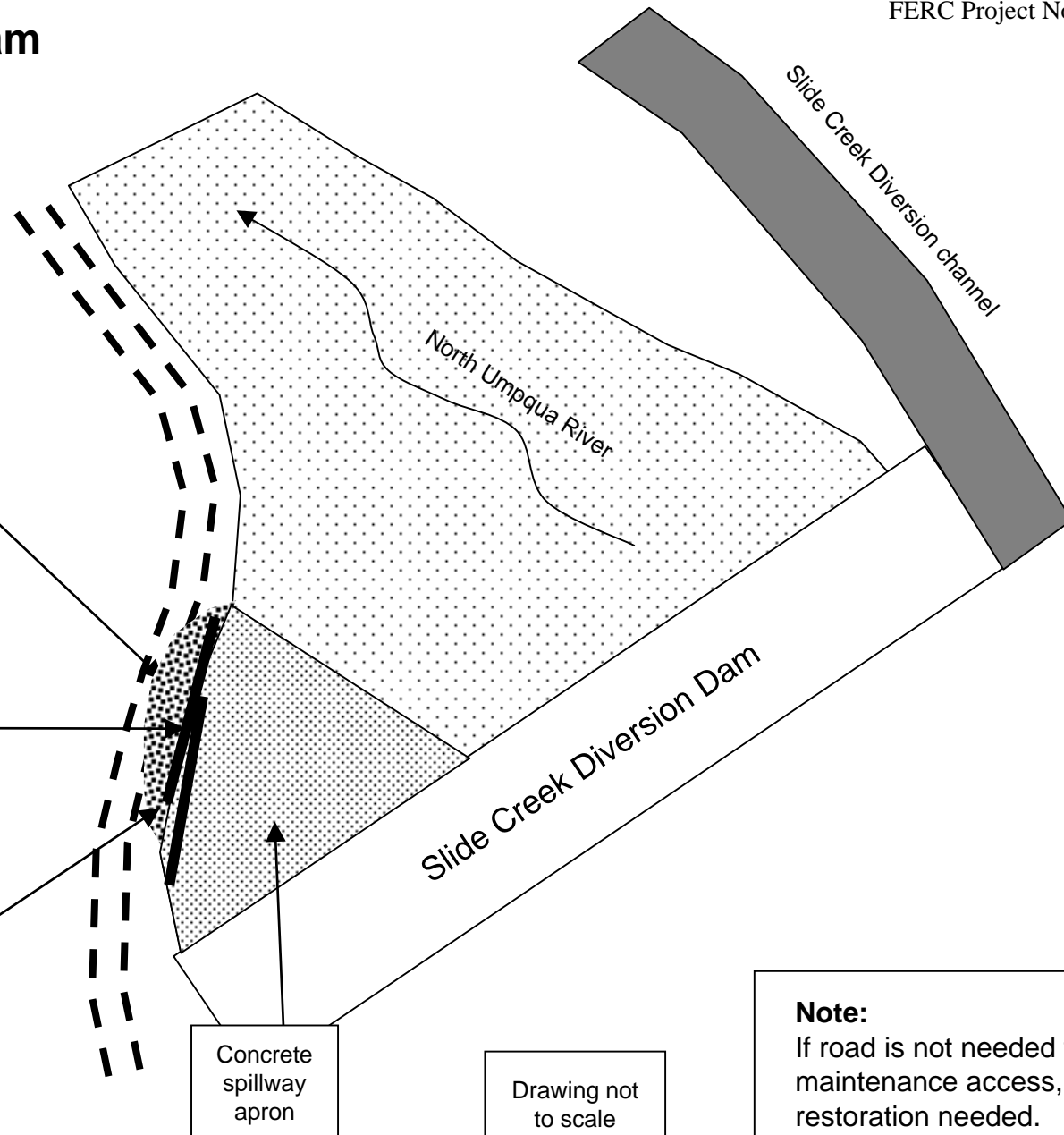
Bank protection formerly provided by large timber crib wall. Timbers have been displaced by past spillway flows.

If restoration is required, construct gabion wall approx. 60 ft long and 30 ft high. Place precast concrete blocks for protection at toe of wall.

Concrete spillway apron

Drawing not to scale

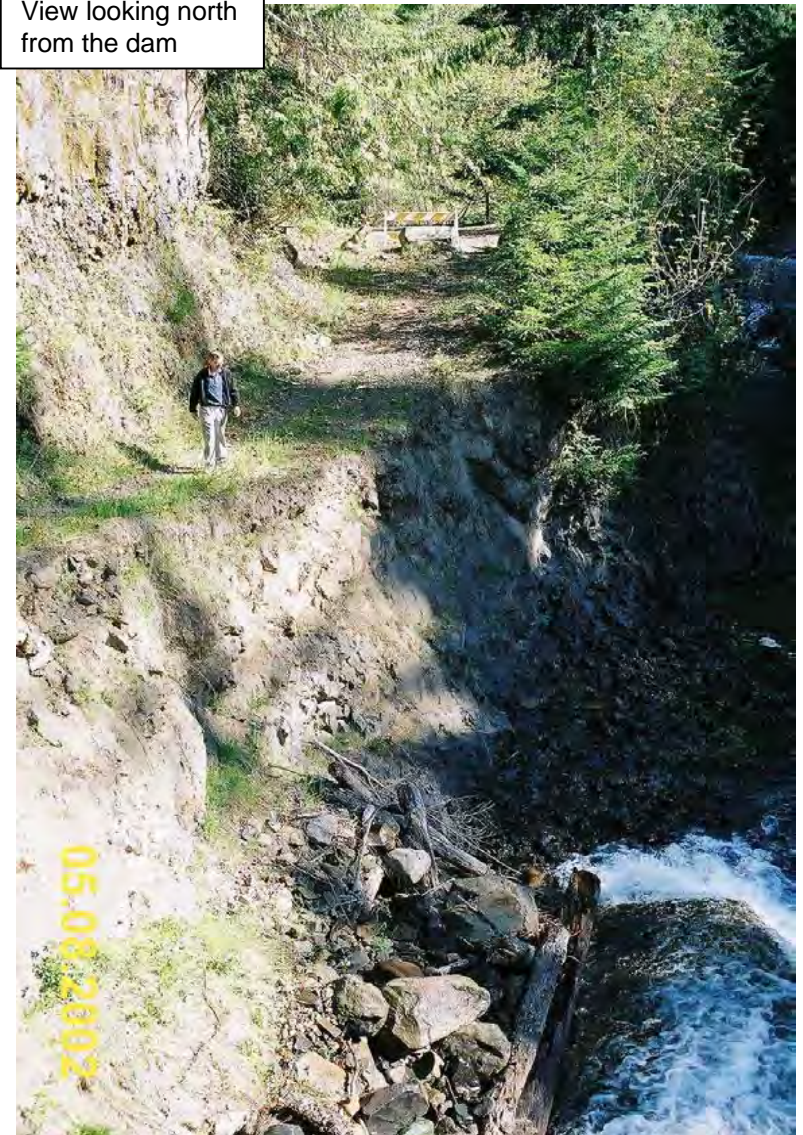
Note:
If road is not needed for maintenance access, no restoration needed.



SC1 Site Photos Slide Creek Diversion Dam



View looking north from the dam



North Umpqua Hydroelectric Project (FERC 1927)
Erosion Control Plan
Site Remediation/Assessment Form

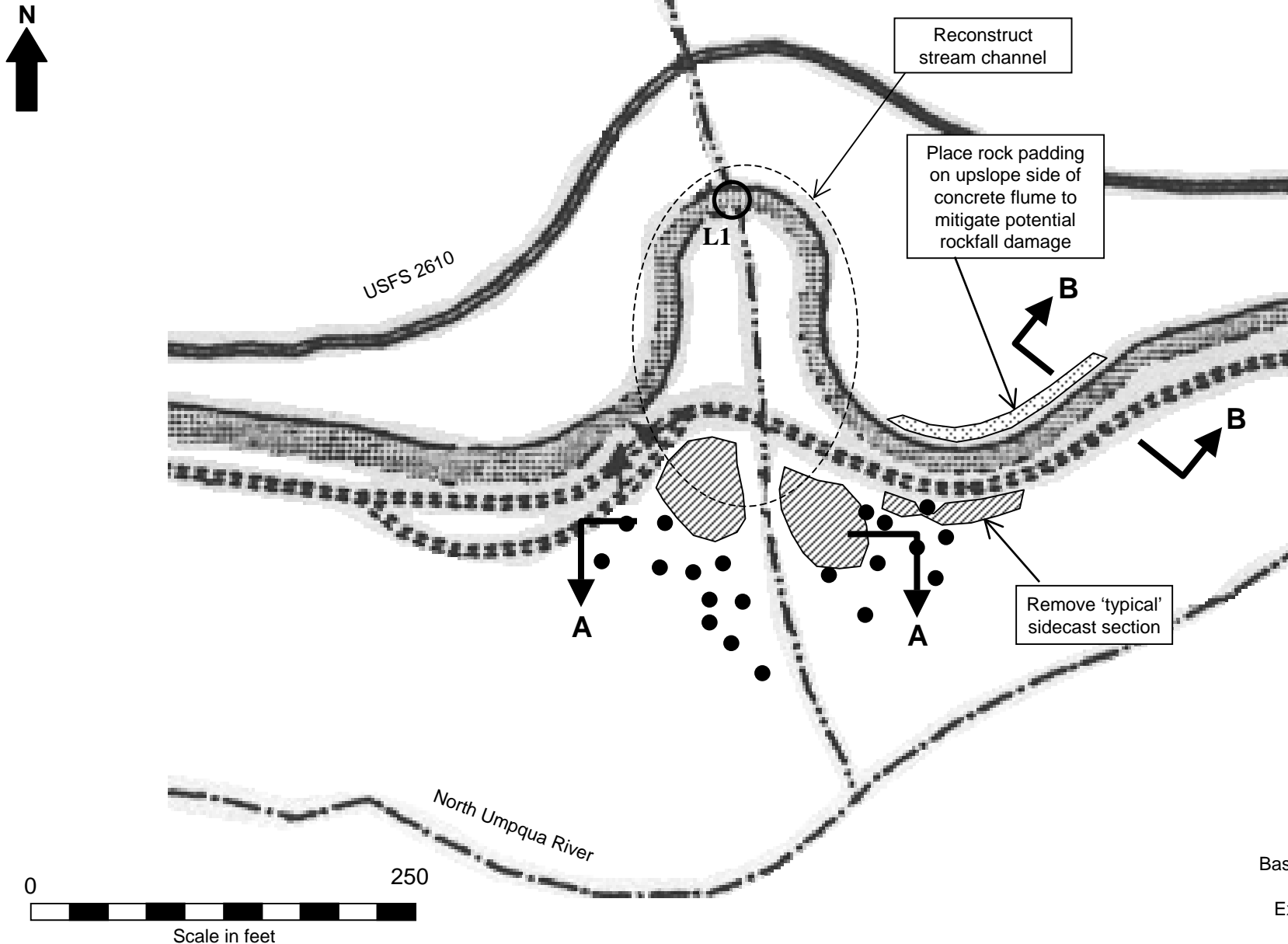
Site # LM1-1		Priority Ranking	Med	Med		Locator Information/GPS			
		Impact Rating	2	2		Start	Lat:	Long:	
Project Development: Lemolo I		Risk Rating	2	2		Reference Point			
Nearest Project Feature: Waterway		Structure Type:	Access Rd & Dble wall conc. flume			End			
Description of Concern: Rockfill breccia and mudflow slope bordering roadway and sidecast below roadway.									
Proposed Remediation: Selective sidecast removal, padding of upslope concrete flume wall and stream restoration.									
Remediation Task Breakdown:		Approx. quantity	units	unit price	Estimated Costs (2001\$)	Additional Comments/Sketches			
Sidecast Removal						Site is at White Mule Creek.			
Excavation		360	CY			Site contains two erosion treatments (1) Rockfill breccia and mudflow slope bordering roadway, and (2) Sidecast below access road.			
Use as padding material (or stockpile)		330	CY						
Waste disposal		30	CY						
Streambed Restoration						Relevant aquatic connectivity site: L1			
Excavate channel		2,800	CY						
Excess fill to stockpile		2,700	CY						
Waste disposal		100	CY			No GPS reception at this site.			
Fill and Regrade		2,630	CY						
Restoration work (large wood, rocks)		4,500	SF						
Stream Crossing over Canal									
Bridge Abutments		20	CY						
Precast panel over canal 20' x 60'		1	EA						
Padding of Upslope Canal Wall									
Clean/Locate Risers at Padding Area		3	EA						
Riser pipes 24" dia. 4' high (assumed)		3	EA						
Pipe Bedding/Wall Drainage Rock (5CY/Riser)		15	CY						
(Cont. on next page)									
Data Collection Information:						Mass Bal	Borrow		CY
Team:	Hanek, Moen, Hansen	Weather:	Overcast, 45 degrees				Excess Fill		CY
Date:	16-Nov-01	Time:	1:30pm				Waste	130	CY

Site Remediation/Assessment Form

Revised: 3/4/2004

LM1-1 Site Plan White Mule Creek

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927

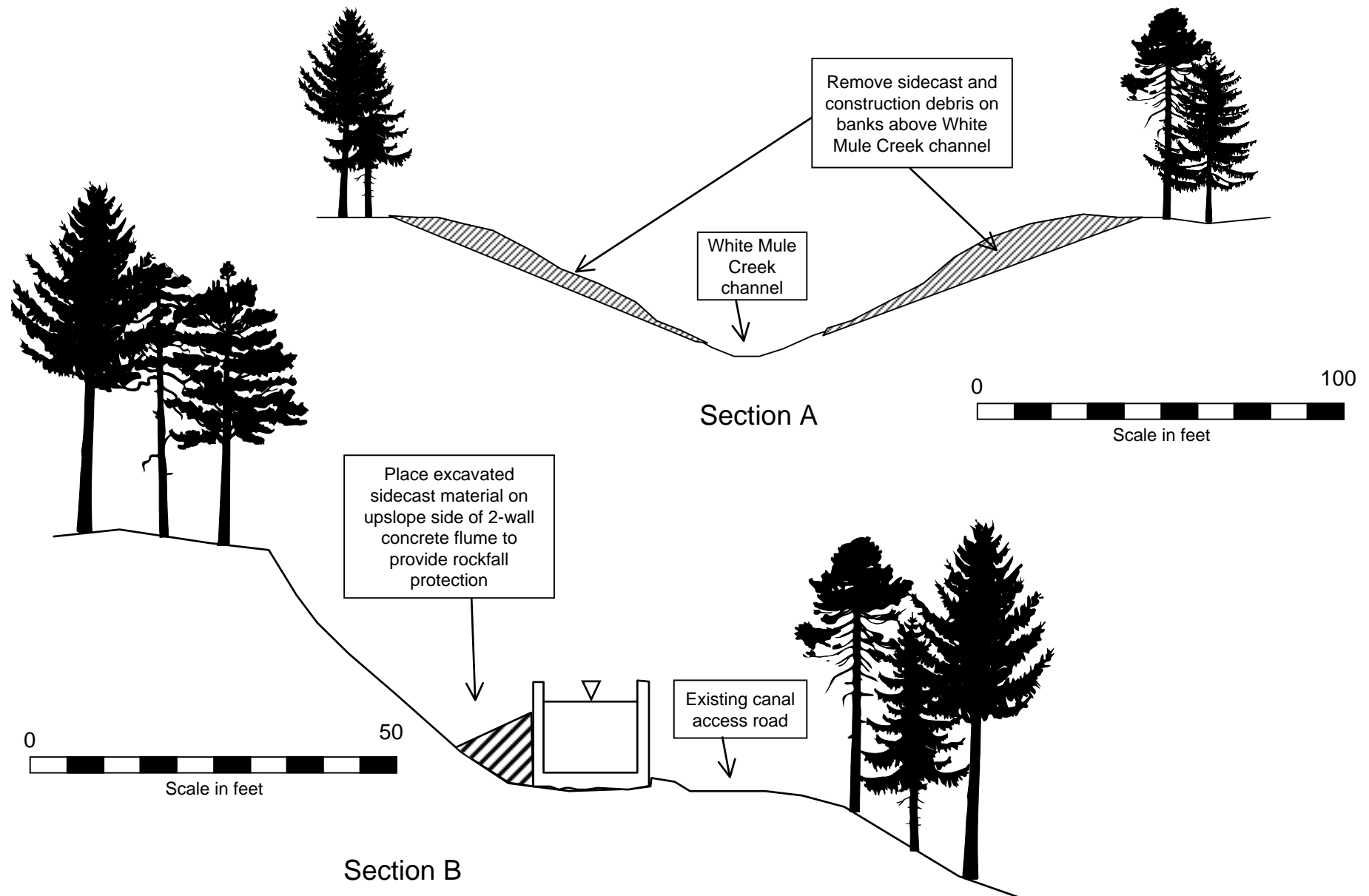


3/11/2004

Revised: 6/28/2002

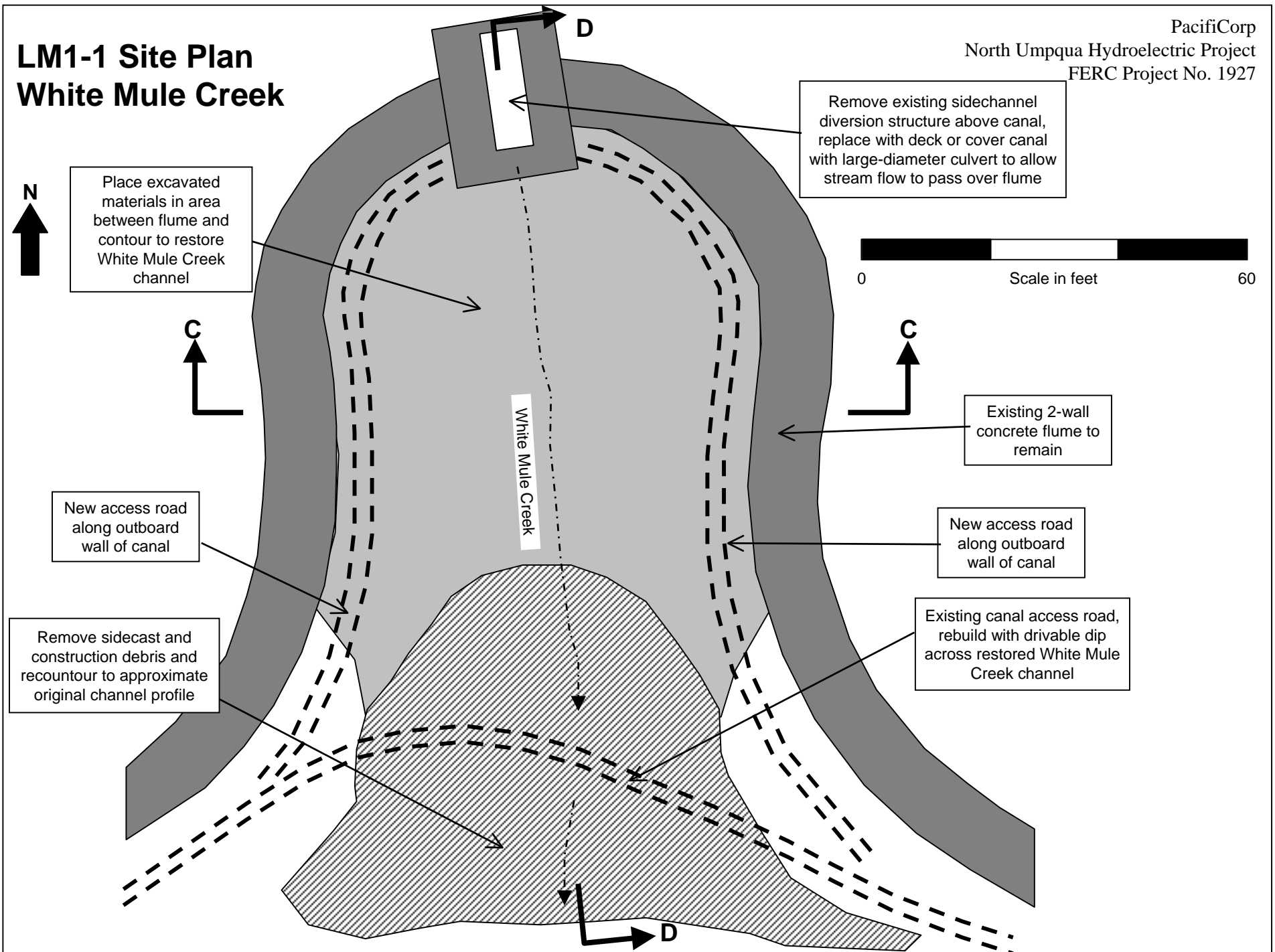
LM1-1 Site Plan White Mule Creek

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



LM1-1 Site Plan White Mule Creek

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927

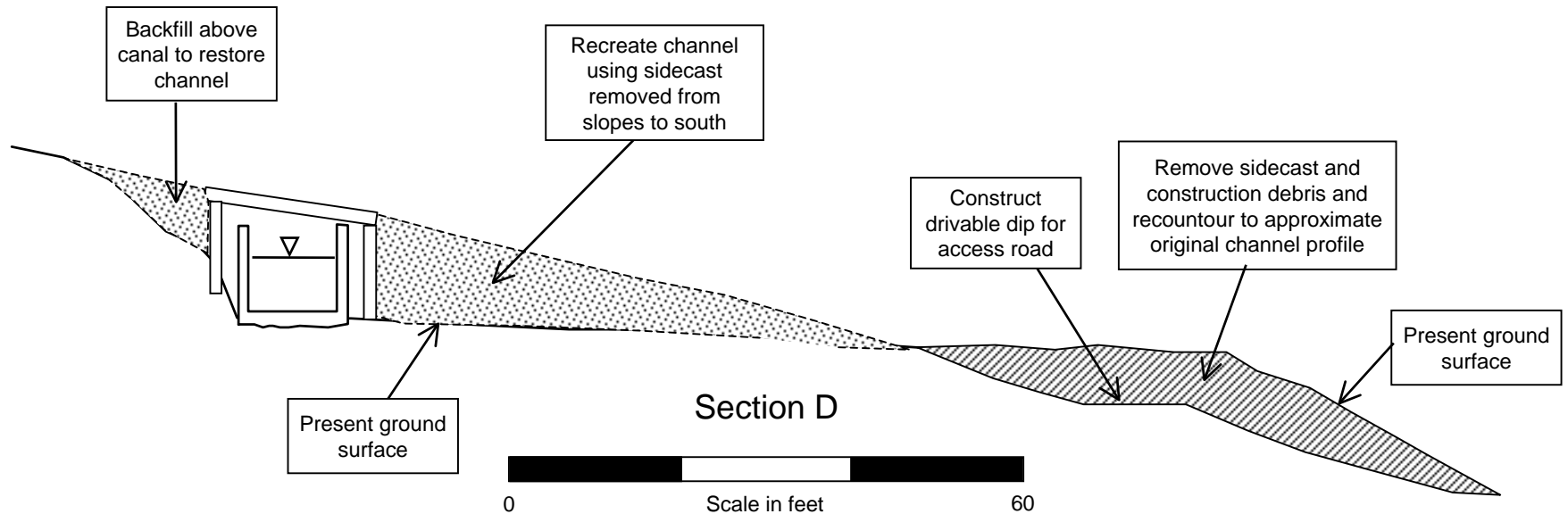
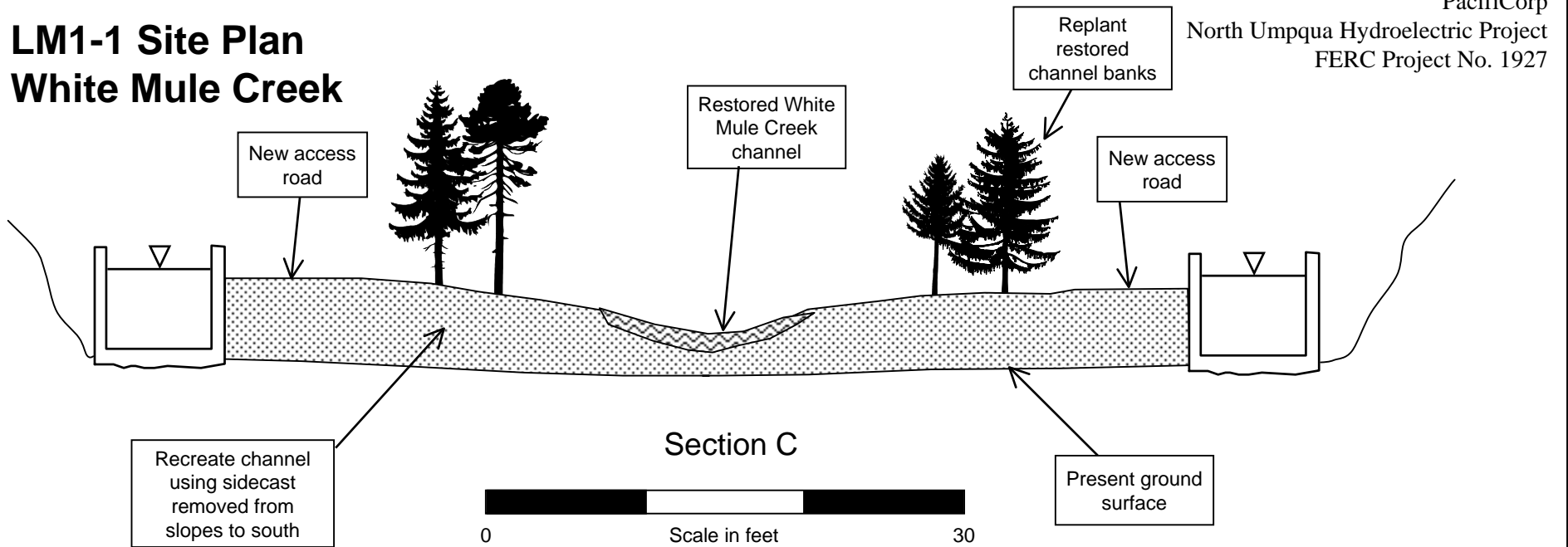


3/11/2004

Revised: 6/28/2002

LM1-1 Site Plan White Mule Creek

PacifiCorp
North Umpqua Hydroelectric Project
FERC Project No. 1927



LM1-1 Site Photos White Mule Creek

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North Umpqua Hydroelectric Project
FERC Project No. 1927



LM1-1 Site Photos White Mule Creek

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North Umpqua Hydroelectric Project
FERC Project No. 1927



WHITE MULE CREEK - STREAM RESTORATION
AT LEMOLO NO.1 CANAL

1. Preparatory Work
 - 1.1 Mobilize Contractor and Construction Equipment
2. Diversion during construction – Sandbag Cofferdam and Continuous Piping
3. Crossing over existing concrete flume
 - 3.1 Pre-cast panel 20'x60'x0.5'
 - 3.2 Concrete footings 20 CY
4. Regrade White Mule Creek channel to original or uniform grade slope
 - 4.1 Volume of Excavation = $(75' \times 5' \times 100') \times 2 = 75,000$ cubic feet = 2,778 cubic yards
 - 4.2 Fill and regrade area where White Mule Creek crosses the concrete flume to approximate original grade using excavated sidecast and fill material and concrete rubble. 2778 CY
5. Streambed restoration, 15' wide stream bed improved over 300' of length 4,500 sf of restored area to include large woody debris and stream bed gravels
6. Sidecast fill removal and revetment
 - 6.1 100' typical section 10' along top, 15' deep with a 3' bench assume total area of cut $(\frac{1}{2}(22' \times 2.5') + \frac{1}{2}(25.5' \times 5.5')) \times 100' = 9,763$ CF = 361 CY (use for canal padding on upslope side of concrete flume)
7. Re-vegetate Exposed Slopes
 - 7.1 Sidecast Surface Area = $30' \times 100' = 3,000$ SF
 - 7.2 Creek Restoration Surface Area = $75' \times 250' \times 2 = 37,500$ SF
8. Padding along canal
 - 8.1 Random fill $200' \times 2\text{CY/LF} = 400$ CY